

PCT
NOTIFICATION OF ELECTION
(PCT Rule 61.2)

From the INTERNATIONAL BUREAU

To:

Commissioner
US Department of Commerce
United States Patent and Trademark
Office, PCT
2011 South Clark Place Room
CP2/5C24
Arlington, VA 22202
ETATS-UNIS D'AMERIQUE
in its capacity as elected Office

Date of mailing (day/month/year) 18 May 2001 (18.05.01)	
International application No. PCT/FI00/00647	Applicant's or agent's file reference 50194
International filing date (day/month/year) 14 July 2000 (14.07.00)	Priority date (day/month/year) 14 July 1999 (14.07.99)
Applicant LAKANIEMI, Ari	

1. The designated Office is hereby notified of its election made:

☒ in the demand filed with the International Preliminary Examining Authority on:
09 February 2001 (09.02.01)

☐ in a notice effecting later election filed with the International Bureau on:

2. The election ☒ was
☐ was not

made before the expiration of 19 months from the priority date or, where Rule 32 applies, within the time limit under Rule 32.2(b).

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No.: (41-22) 740.14.35	Authorized officer Claudio Borton Telephone No.: (41-22) 338.83.38
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PCT

**NOTIFICATION OF THE RECORDING
OF A CHANGE**

(PCT Rule 92bis.1 and
Administrative Instructions, Section 422)

From the INTERNATIONAL BUREAU

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Date of mailing (day/month/year) 13 December 2001 (13.12.01)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 50194	
International application No. PCT/FI00/00647	International filing date (day/month/year) 14 July 2000 (14.07.00)

1. The following indications appeared on record concerning:

☒ the applicant ☐ the inventor ☐ the agent ☐ the common representative

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State of Residence

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2. The International Bureau hereby notifies the applicant that the following change has been recorded concerning:

☒ the person ☐ the name ☒ the address ☐ the nationality ☐ the residence

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State of Nationality

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3. Further observations, if necessary:

4. A copy of this notification has been sent to:

☒ the receiving Office ☐ the designated Offices concerned
☐ the International Searching Authority ☒ the elected Offices concerned
☐ the International Preliminary Examining Authority ☐ other:

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No.: (41-22) 740.14.35

Authorized officer

Anne KARKACHI

Telephone No.: (41-22) 338.83.38

PATENT COOPERATION TREATY

PCT

NOTICE INFORMING THE APPLICANT OF THE COMMUNICATION OF THE INTERNATIONAL APPLICATION TO THE DESIGNATED OFFICES

(PCT Rule 47.1(c), first sentence)

From the INTERNATIONAL BUREAU

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Berggren Oy Ab

- 9 -02- 2001

Date of mailing (day/month/year) 01 February 2001 (01.02.01)		IMPORTANT NOTICE	
Applicant's or agent's file reference 50194 <i>SKU/122</i>			
International application No. PCT/FI00/00647	International filing date (day/month/year) 14 July 2000 (14.07.00)	Priority date (day/month/year) 14 July 1999 (14.07.99)	
Applicant NOKIA NETWORKS OY et al			

1. Notice is hereby given that the International Bureau has communicated, as provided in Article 20, the international application to the following designated Offices on the date indicated above as the date of mailing of this Notice:
AU,KP,KR,US

In accordance with Rule 47.1(c), third sentence, those Offices will accept the present Notice as conclusive evidence that the communication of the international application has duly taken place on the date of mailing indicated above and no copy of the international application is required to be furnished by the applicant to the designated Office(s).

2. The following designated Offices have waived the requirement for such a communication at this time:
AE,AG,AL,AM,AP,AT,AZ,BA,BB,BG,BR,BY,BZ,CA,CH,CN,CR,CU,CZ,DE,DK,DM,DZ,EA,EE,EP,ES,FI,GB,GD,GE,GH,GM,HR,HU,ID,IL,IN,IS,JP,KE,KG,KZ,LC,LK,LR,LS,LT,LU,LV,MA,MD,MG,MK,MN,MW,MX,MZ,NO,NZ,OA,PL,PT,RO,RU,SD,SE,SG,SI,SK,SL,TJ,TM,TR,TT,TZ,UA,UG,UZ,VN,YU.
The communication will be made to those Offices only upon their request. Furthermore, those Offices do not require the applicant to furnish a copy of the international application (Rule 49.1(a-bis)).
3. Enclosed with this Notice is a copy of the international application as published by the International Bureau on
01 February 2001 (01.02.01) under No. WO 01/08136

REMINDER REGARDING CHAPTER II (Article 31(2)(a) and Rule 54.2)

If the applicant wishes to postpone entry into the national phase until 30 months (or later in some Offices) from the priority date, a demand for international preliminary examination must be filed with the competent International Preliminary Examining Authority before the expiration of 19 months from the priority date.

It is the applicant's sole responsibility to monitor the 19-month time limit.

Note that only an applicant who is a national or resident of a PCT Contracting State which is bound by Chapter II has the right to file a demand for international preliminary examination.

REMINDER REGARDING ENTRY INTO THE NATIONAL PHASE (Article 22 or 39(1))

If the applicant wishes to proceed with the international application in the national phase, he must, within 20 months or 30 months, or later in some Offices, perform the acts referred to therein before each designated or elected Office.

For further important information on the time limits and acts to be performed for entering the national phase, see the Annex to Form PCT/IB/301 (Notification of Receipt of Record Copy) and Volume II of the PCT Applicant's Guide.

The International Bureau of WIPO 34, chemin des Colombettes 1211 Geneva 20, Switzerland Facsimile No. (41-22) 740.14.35	Authorized officer J. Zahra Telephone No. (41-22) 338.83.38
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PATENT COOPERATION TREATY

PCT

From the INTERNATIONAL BUREAU

NOTIFICATION CONCERNING
SUBMISSION OR TRANSMITTAL
OF PRIORITY DOCUMENT

(PCT Administrative Instructions, Section 411)

To:

Berggren Oy Ab
BERGGREN OY AB
P.O. Box 16 19-12-2000
FIN-00101 Helsinki
FINLANDE
SKC 196K

Date of mailing (day/month/year) 30 November 2000 (30.11.00)	IMPORTANT NOTIFICATION
Applicant's or agent's file reference 50194	
International application No. PCT/FI00/00647	
International publication date (day/month/year) Not yet published	
Applicant NOKIA NETWORKS OY et al	International filing date (day/month/year) 14 July 2000 (14.07.00) Priority date (day/month/year) 14 July 1999 (14.07.99)

- The applicant is hereby notified of the date of receipt (except where the letters "NR" appear in the right-hand column) by the International Bureau of the priority document(s) relating to the earlier application(s) indicated below. Unless otherwise indicated by an asterisk appearing next to a date of receipt, or by the letters "NR", in the right-hand column, the priority document concerned was submitted or transmitted to the International Bureau in compliance with Rule 17.1(a) or (b).
- This updates and replaces any previously issued notification concerning submission or transmittal of priority documents.
- An asterisk(*) appearing next to a date of receipt, in the right-hand column, denotes a priority document submitted or transmitted to the International Bureau but not in compliance with Rule 17.1(a) or (b). In such a case, **the attention of the applicant is directed to Rule 17.1(c)** which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.
- The letters "NR" appearing in the right-hand column denote a priority document which was not received by the International Bureau or which the applicant did not request the receiving Office to prepare and transmit to the International Bureau, as provided by Rule 17.1(a) or (b), respectively. In such a case, **the attention of the applicant is directed to Rule 17.1(c)** which provides that no designated Office may disregard the priority claim concerned before giving the applicant an opportunity, upon entry into the national phase, to furnish the priority document within a time limit which is reasonable under the circumstances.

<u>Priority date</u>	<u>Priority application No.</u>	<u>Country or regional Office or PCT receiving Office</u>	<u>Date of receipt of priority document</u>
14 July 1999 (14.07.99)	991605	FI	17 Octo 2000 (17.10.00)

The International Bureau of WIPO
34, chemin des Colombettes
1211 Geneva 20, Switzerland

Facsimile No. (41-22) 740.14.35

Authorized officer

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PCT REQUEST

50194

Original (for SUBMISSION) - printed on 14.07.2000 10:21:54 AM

0	For receiving Office use only	
0-1	International Application No.	
0-2	International Filing Date	
0-3	Name of receiving Office and "PCT. International Application"	
0-4	Form - PCT/RO/101 PCT Request	
0-4-1	Prepared using	PCT-EASY Version 2.90 (updated 10.05.2000)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	National Board of Patents and Registration (Finland) (RO/FI)
0-7	Applicant's or agent's file reference	50194
I	Title of invention	METHOD FOR DECREASING THE PROCESSING CAPACITY REQUIRED BY SPEECH ENCODING AND A NETWORK ELEMENT
II	Applicant	
II-1	This person is:	applicant only
II-2	Applicant for	all designated States except US
II-4	Name	NOKIA NETWORKS OY
II-5	Address:	P.O. Box 300 FIN-00045 Nokia Group Finland
II-6	State of nationality	FI
II-7	State of residence	FI
II-8	Telephone No.	+358-9-51121
II-9	Facsimile No.	+358-9-51168080
III-1	Applicant and/or inventor	
III-1-1	This person is:	applicant and inventor
III-1-2	Applicant for	US only
III-1-4	Name (LAST, First)	LAKANIEMI, Ari
III-1-5	Address:	Suvantokatu 1 D 30 FIN-33100 Tampere Finland
III-1-6	State of nationality	FI
III-1-7	State of residence	FI

PCT REQUEST

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50194

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IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
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IV-1-4	Facsimile No.	+358-9-6933944
IV-1-5	e-mail	email.box@berggren.fi
V	Designation of States	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW MZ SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH&LI CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
V-5	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	Exclusion(s) from precautionary designations	NONE

PCT REQUEST

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VI-1	Priority claim of earlier national application		
VI-1-1	Filing date	14 July 1999 (14.07.1999)	
VI-1-2	Number	991605	
VI-1-3	Country	FI	
VI-2	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1	
VII-1	International Searching Authority Chosen	Swedish Patent Office (ISA/SE)	
VIII	Check list	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	11	-
VIII-3	Claims	2	-
VIII-4	Abstract	1	50194.txt
VIII-5	Drawings	4	-
VIII-7	TOTAL	22	
VIII-8	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-10	Copy of general power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-18	Figure of the drawings which should accompany the abstract	2	
VIII-19	Language of filing of the international application	Finnish	
IX-1	Signature of applicant or agent	<i>Sirpa Kuisma</i>	
IX-1-1	Name	BERGGREN OY AB	
IX-1-2	Name of signatory	Sirpa Kuisma	
IX-1-3	Capacity	Patent Attorney	

FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	
10-2	Drawings:	
10-2-1	Received	
10-2-2	Not received	
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application	
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)	
10-5	International Searching Authority	ISA/SE
10-6	Transmittal of search copy delayed until search fee is paid	

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11-1	Date of receipt of the record copy by the International Bureau	
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Our ref: 50194/SKU/EL


INTERNATIONAL PATENT APPLICATION NO. PCT/FI00/00647
METHOD FOR DECREASING THE PROCESSING CAPACITY REQUIRED BY
SPEECH ENCODING AND A NETWORK ELEMENT
APPLICANT: NOKIA NETWORKS OY ET AL

Dear Sirs,

We now enclose an English translation of the specification of this application and certify that it is a true translation into English of the Finnish language specification originally filed in this application.

We also enclose the formal drawing 2/4 completed with the English language text.

BERGGREN OY AB


Sirpa Kuisma
Patent Attorney

- MALL
- DESIGN
- L. Vailax

- TAX MATTERS
- TRADEMARKS
- LEGAL MATTERS

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ENCLOSURES

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Trade Reg. No.	80.802
LY	0107002-7
VAT	F101070027
Kotipaikka	Hel sinki

Method for decreasing the processing capacity required by speech encoding and decoding and a network element

5 In general, this invention relates to speech encoding and decoding used in digital radio systems and particularly a method by which the processing capacity required can be reduced in a telecommunication system using discontinuous transmission between a transmitter and a receiver.

10 In the arrangement used in modern speech encoding techniques, speech codecs process the speech signal in periods, which are called speech frames or just frames. Here the term codec means the arrangement by which speech can be encoded. Preferably it comprises an encoding algorithm and means for implementing it on a speech signal. A typical frame length of a speech codec is 20 ms, which corresponds to 160 samples at a sampling frequency of 8 kHz. The speech frames generally vary from 10 ms to 30 ms. Each speech frame is processed in a speech encoder, and 15 certain encoding parameters are formed of these frames and transmitted to the decoder. The decoder forms a synthesized speech signal by means of those parameters.

20 In digital cellular radiotelephony systems, such as the GSM (Global System for Mobile communications), a discontinuous transmission method (DTX, Discontinuous Transmission), which is also defined in many speech encoding standards, is generally used. The discontinuous transmission method generally means that the transmitter part of the terminal is switched off for most of the time when the user does not speak, i.e., when the terminal has nothing to transmit. The purpose of this is to reduce the average power consumption of the terminal and to 25 improve the utilization of radio frequencies, because transmitting a signal, which carries just silence, causes unnecessary interference with other simultaneous radio connections. According to some research, only 40% of the data transmitted contains actual speech data. The rest is silence or background noise. Thus a discontinuous transmission method, in which frames that do not contain actual speech are 30 removed, provides many advantages. Firstly, the processing load of the encoder can be reduced, because the "redundant" frames are not encoded at all. Secondly, when the number of frames to be transmitted is reduced, the power consumption of the device is also reduced. Furthermore, the loading of the network can be reduced, when "redundant" frames are removed from the data to be transmitted.

An operation called Voice Activity Detection (VAD) is used for speech detection in a discontinuous transmission method. The voice activity detection takes place e.g. so that a voice activity detector is arranged to examine each frame to be transmitted, and on the basis of the examination it is concluded whether the frame contains speech data or not. The operation of the voice activity detector is based on its internal variables, and the output of the detector is preferably one bit, which is called the VAD flag. Value 1 of the VAD flag then corresponds to a situation where there is speech to be processed, and value 0 a situation where the user is silent. Thus when the flag is up, the frame contains speech data and it can be transmitted. Correspondingly, when the VAD flag is down, the frame can be entirely removed.

The discontinuous transmission method has one disadvantage. When the transmission is interrupted, the background noise that exists in the frames that contain speech, also disappears. This may cause a very unpleasant effect at the receiving end. In a discontinuous transmission method, the interruption of the transmission may take place quickly and at irregular intervals, whereby the receiver experiences the quickly changing voice level as disturbing. Especially when the level of the background noise is high, the interruption of the transmission may even make it more difficult to understand the speech. Therefore it is advantageous to produce in the receiver some synthetic noise, which resembles the background noise of the transmitter and which is called Comfort Noise (CN), even when no frames are transmitted to the receiving end.

The production of comfort noise takes place e.g. so that at first the level of the actual background noise is estimated by means of some frames that contain background noise when the value of the VAD flag changes from one to zero. The element that decides about the discontinuous transmission mode transmits these few frames to the receiver as speech frames. This period when the speech burst has ended, but the transmission of speech frames has not yet been switched off, is called a hangover period. The frames that are transmitted during the hangover period, only contain data caused by background noise, whereby the parameters of the comfort noise can be safely determined by means of these frames. A Silence Descriptor (SID) frame is advantageously used for transmitting the comfort noise parameters to the receiver. The values of the parameters of the SID frames are updated regularly, and at least when the level of the background noise changes. In practice, the SID frame can be used in at least the following two ways. Firstly, a SID frame is transmitted immediately after the hangover period. After this, SID frames are transmitted regularly. An arrangement like this is used in the speech codecs of the

GSM system, for example. Another possibility is to transmit a SID frame immediately after the hangover period, but to transmit the next SID frame only when the encoder detects a change in the characteristics of the background noise.

In an ideal situation, both the transmitting terminal and the receiving terminal use the same speech encoding method. In a case like this, the encoded speech need not be changed suitable for some other encoding method. However, in practice this is often necessary. In a situation like this, the encoded speech data is encoded differently by means of a transcoder. The transcoder can be located at any point of the signal path between the transmitter and the receiver.

- 10 The prior art transcoders are typically implemented in a manner shown in Fig. 1. The input of the transcoder consists of the input parameters 101 transmitted by the transmitter. The discontinuous transmission reception block 102 of the transcoder has been arranged to estimate whether the parameters received contain speech or comfort noise. Information about the contents of the frame is transmitted to the
- 15 speech encoder 104 by means of the SP (Speech Present) flag 103, for example. In addition, the frame is also transmitted to the speech decoder 104. The decoding method of the frame depends on the value of the SP flag 103. After decoding, the synthesized speech or comfort noise is transferred to the internal buffer circuit 105 of the transcoder. The recoding of the contents of the buffer circuit 105 is started
- 20 when the buffer circuit 105 contains a sufficient amount of data. When data is recoded, the voice activity detector 106 is used at first to examine whether the frame contains speech or background noise. On the basis of the quality of the data contained by the frame, the voice activity detector 106 forms a VAD flag 107 and gives it a value. In addition, it transmits the value of the VAD flag 107 and the
- 25 frame that arrived to it as such forward to the speech encoder 108. The value of the VAD flag 107 is also given to the transmitter unit 110 of the transcoder. The speech encoder 108 processes the data coming to it and transmits the parameters 109 of the encoded data to the transmitter unit 110. The transmitter unit 110 checks on the basis of the values of the VAD flags 107 it received which frames are to be
- 30 transmitted to the network and which not. In order to make the receiver block of the terminal receiving the signal also to maintain the generation of comfort noise, some frames containing comfort noise can also be transmitted to the receiver, and the parameters of these frames containing comfort noise have been updated in the speech encoder 108, when required.
- 35 The problem in the prior art solutions is the fact that the voice activity detector is used twice. For the first time it is used in the encoder circuit of the transmitting

terminal and then again in the transcoder. In practice, this means that unnecessary computation procedures are carried out when speech data is transmitted, because in prior art solutions the same voice activity detection procedure is performed twice on the same data flow.

- 5 It is an objective of this invention to eliminate the above mentioned problem of the prior art.

The objectives of the invention are achieved by implementing a transcoder arrangement, by means of which the quality of the contents of the frame can be checked in a simple manner, whereby excessive use of processing capacity is
10 avoided.

The method according to the invention for matching two different encoding methods in a telecommunication system using a discontinuous transmission method between the transmitter and receiver is characterized in that in the signal path the signals transmitted by the transmitter are made suitable for the receiver so that

- 15 - for a data frame, at least one information parameter containing at least two content identifiers is formed of the data parameters received,
- data corresponding to the original data is synthesized from the data parameters of the received frames,
- the synthesized data is transmitted for recoding with an encoding method suitable
20 for the receiver,
- during recoding, at least some data parameters of the frames are updated on the basis of at least one value of the content identifiers and
- on the basis of the value of at least one other content identifier, the frames to be transmitted to the receiver are selected from all recoded data frames.

25 The network element according to the invention, which is arranged to match two different encoding methods in a telecommunication system using a discontinuous transmission method between the transmitter and receiver is characterized in that in the signal path the signals transmitted by the transmitter are arranged to be made suitable for the receiver by a network element, which comprises

- 30 - means by which at least one information parameter containing at least two content identifiers is formed for a data frame of the data parameters received,

- means by which synthesized data corresponding to the original contents of the data is formed of the data parameters of the received frames,

- means for recoding the synthesized data with an encoding method suitable for the receiver,

5 - means for updating the data parameters of at least some frames on the basis of at least one value of the content identifiers and

- means for selecting the frames to be transmitted to the receiver on the basis of at least one other value of the content identifiers from all the recoded data frames.

Preferred embodiments of the invention are described in the dependent claims.

10 According to the invention, the procedure for carrying out voice activity detection is removed from the signal path, preferably from the transcoder. By an arrangement like this, the structure of the transcoder can be simplified and processing capacity can be saved for other purposes. Information about the contents of the frames is preferably transmitted by means of at least one information parameter, which
15 comprises at least two different content identifiers, to the element which makes the decision about the frames to be transmitted forward.

In the following, the invention will be described in more detail with reference to the accompanying drawings, in which

Figure 1 is a block diagram of a prior art transcoder,

20 Figure 2 shows a transcoder according to one embodiment of the invention,

Figures 3a and 3b show some possibilities of using the flag bits of a transcoder according to the invention to indicate the contents of the frames,

Figure 4 shows a first network arrangement, in which a transcoder according to the invention is applied,

25 Figure 5 shows another network arrangement, in which a transcoder according to the invention is applied, and

Figure 6 shows a third network arrangement, in which a transcoder according to the invention is applied.

In the figures, the same reference numbers and markings are used for corresponding parts. Figure 1 was discussed above in connection with the description of the prior art.

Figure 2 shows a preferred embodiment of a transcoder according to the invention.

5 The transcoder receives as its input the parameters 101 formed of the speech signal at the transmitting end. The reception block 102 of the transcoder processes the received data and forms an SP flag 103 thereof. The SP flag 103 indicates whether the received frame contains speech data or comfort noise. Here speech data is thus either an actual speech signal or background noise. For example, when the value of the SP flag 103 is 1, the frame contains speech data or background noise, and when
10 the value of the SP flag 103 is 0, the frame contains comfort noise. A frame containing comfort noise is called a SID frame here according to the above description. In addition to the SP flag 103, the reception block 102 determines the HO flag 201 from the received frames. The HO flag 201 can be given the value 1, if
15 the frame is the first one after the hangover period, otherwise the value is 0. It is clear to a person skilled in the art that the HO flag indicates that background noise has been transmitted in the transmission during the hangover period, by means of which background noise the parameters contained by the SID frames can be updated. The SP flag 103 and the HO flag 201 are preferably transmitted to the
20 buffer circuit 105. The value of the SP flag 103 of a certain frame is also transmitted to the decoder 104 together with the data parameters contained by the frame. The decoder 104 is arranged to decode the data parameters of the frame that arrived to it into synthesized speech data and to transmit the synthesized speech frame or comfort noise frame to the internal buffer circuit 105. The decoding method used by
25 the decoder 104 is preferably dependent on the value of the SP flag 103. The speech encoder 108 after the buffer circuit 105 is arranged to read the HO flag 201, SP flag 103 and the synthesized data frame related to them, which are in the buffer circuit 105. The speech encoder 108 starts the recoding of the data e.g. in a corresponding manner as in the prior art solutions, i.e. when adequate data has been fed to the
30 buffer circuit 105. The speech encoder 108 can also update the data parameters of the comfort noise contained by the SID frames. The speech encoder 108 transmits the parameters 107 formed of the data and the SP flag 103 to the transmitter unit 110. The transmitter unit 110 checks the value of the SP flag 103 of each frame and transmits forward at least the parameters of the frames which contain speech data.
35 Preferably, in addition to these frames, some frames which contain comfort noise parameters are transmitted to the receiver so that the receiver can use them to

minimize unpleasant reception effects. It is clear to a person skilled in the art that the decoder 104 and the encoder 108 can be arranged to use different codecs.

It has been described above that the two flags, the SP flag 103 and the HO flag 201 are separate content identifiers, which can be used to indicate the type of data
5 contained by each frame, for example. It is clear to a person skilled in the art that the information contained by the content identifiers can also be gathered under one parameter. A parameter like this may be called an information parameter, for example, and it may be a hexadecimal number or the like. In the information parameter arrangement, the first bit of the value of the parameter, for example,
10 indicates the value of the SP flag 103 and the second bit the value of the HO flag 201, and the values of these bits can be changed independently of each other. The information parameter can thus have one value, and the values of different content identifiers can be found out by examining different parts of the value. It is also clear to a person skilled in the art that values of other corresponding flags can also be
15 included in the information parameter when required, which values may be needed for other purposes in speech encoding, for example. The information parameter can belong to any number system or the like, which is suitable for the above mentioned purpose.

Fig. 3a shows in the form of a timing diagram the modes of the content identifiers used in the invention, i.e. the SP flag 103 and the HO flag 201, depending on the
20 contents of the frame. In the exemplary embodiment shown here, the first three frames contain speech data, whereby the value of the SP flag 103 is 1. In this embodiment, these frames are followed by a hangover period, which lasts for four frames altogether, and also then the value of the SP flag 103 is 1. During the
25 hangover period, the transmission has not yet been interrupted, although the speech burst has ended. Background noise is advantageously transmitted in the frames, by means of which possible new parameters can be defined for the comfort noise formed of the background noise. It is clear to a person skilled in the art that the HO flag 201 can be advantageously used to define for the speech encoder 108 when
30 there is a hangover period after the frames that contain actual speech data. The frames that belong to this hangover period contain background noise, and on the basis of the information contained by these frames, the comfort noise parameters of the SID frames can be updated. During the transmission of the SID frames, the values of the SP flag 103 and the HO flag 201 are zero. It is clear to a person skilled
35 in the art that when frames that contain some data, such as speech or background

noise, come to the signal to be transmitted, the flags rise to the correct values according to the description above.

Fig. 3b shows a timing diagram of another arrangement according to the invention, in which the modes of the SP flag 103 and the HO flag 201 are arranged to be settled differently than in the case of Fig. 3a. In this exemplary case, the first three frames contain speech data, whereby the value of the SP flag 103 is 1. In this embodiment, these frames are followed by a hangover period, which lasts for four frames altogether, and also then the value of the SP flag 103 is 1. During the hangover period, the transmission has not yet been interrupted, although the speech burst has ended. Background noise is advantageously transmitted in the frames, by means of which possible new parameters can be defined for the comfort noise formed of the background noise. In this exemplary embodiment, the HO flag 201 is arranged to rise when the first frame of the hangover period has its turn of transmission. The identification of the first frame of the hangover period can be arranged in the receiver block 102, for example. In this exemplary embodiment the HO flag 201 is also arranged to be kept up until the first SID frame after the hangover period. It is clear to a person skilled in the art that the modes of the flags mentioned above can be arranged such that they are best suited for each application in which the flags are used.

The arrangement discussed above provides clear advantages as compared to the prior art solutions. Generally it is obvious that the algorithms used for voice activity detection are often very complicated and thus very heavy to perform. By skipping one extra voice activity detection, signal processing as a whole can be simplified and processing capacity can be saved for other operations. The arrangement according to the invention is particularly advantageous in a situation where more than one transcoders have been integrated in one apparatus. In that case, the total saving of processing capacity may be substantial. According to some tests, in the case of a Full Rate (FR) codec used in the GSM system, for example, the reduction of one determination of voice activity detection has substantially reduced the complexity of processing.

Another advantage provided by the arrangement according to the invention is also related to simpler implementation. Namely, although the voice activity detection is the same with each codec, there may be differences in the way that the voice activity detector is implemented. In prior art arrangements it is possible that the comfort noise produced by a certain codec can be interpreted as speech in the voice activity detector of another codec, in which case the system is unnecessarily loaded.

Especially it has to be noted that the codecs often encode frames that are classified as noise or the like in a simpler manner than frames that are classified as speech. Thus if a frame that contains noise is classified as speech, a larger amount of processing capacity is used for this frame, and the process becomes heavier. By
5 leaving the voice activity detection out from the transcoder, problems like this, which result in the use of unnecessarily high processing power, can be avoided.

In the above description of the invention it has been assumed that the frame times in different codecs are the same. The arrangement according to the invention can advantageously also be used in a case where the frame times between different
10 codecs are different. Let us assume, by way of example, that codec A with a frame time of 20 ms, for example, has been used for the data coming to the transcoder. The system to which the data is to be transmitted, uses codec B with a frame time of 30 ms, for example. In an arrangement according to the invention, in a case like this the matching of the frame times can be implemented by, for example, arranging the
15 SP and HO flags at intervals of 10 ms in the data in the buffer circuit 105. Thus, when the data of codec A is changed into data of codec B, the decoder writes two SP and HO flags in the buffer circuit 105 for each frame. Correspondingly, when the speech encoder reads data from the buffer circuit 105, it preferably reads three SP and HO flags per frame, or 30 ms altogether. On the basis of these three pairs of
20 flags, the transcoder classifies the new frame either as speech or noise and gives the SP flag a value based on the classification. At the simplest, the classification may be based on the criterion that if at least two of the SP flags are up, the value of the new SP flag is also 1. It is clear to a person skilled in the art that other possible solutions, such as different combinations of the SP and HO flags can also be used in the
25 classification. If the transcoder operates in the other direction, it is clear that the decoder writes three pairs of flags in the buffer circuit, of which the speech encoder preferably reads two pairs of flags per frame. It is clear to a person skilled in the art that the flags can also be arranged in the data flow with different intervals than those mentioned above. Preferably the interval is such that the intervals of the
30 frames of codec A and codec B are both divisible by the interval.

It is clear to a person skilled in the art that the hangover period, which has an effect on the value of the HO flag, is dependent on the codec. For example, the hangover period of an FR codec of the GSM system is four frames of 20 ms, whereas in the codec presented in the standard ITU-T G.723.1, for example, the hangover period is
35 six frames of 30 ms. With the method according to the invention, possible problems caused by the lengths of different hangover periods can be avoided. For example, if

the hangover period of codec A is temporally longer than the hangover period produced by codec B, there are no problems, because the speech encoder can remove the extra portion of the hangover period when required. On the other hand, if the hangover period of codec A is temporally shorter than the hangover period of codec B, the hangover period can be increased in the speech encoder, when required. This can be implemented e.g. by using the same frames containing comfort noise to new frames during the hangover period.

In the next passage, the application of an arrangement according to the invention in a mobile communication network, such as the GSM network, will be discussed. The transcoder is preferably located between the terminals as connected to a network element. In the GSM network, for example, there has been arranged a separate network element called TRAU (Transcoder/Rate Adaptor Unit). Generally speaking, the task of the TRAU unit is to match networks using different signals. This means, for example, that the signal transfer rates are adapted for the systems. In addition, speech is recoded in the TRAU to make it suitable for transmission to a network using another speech encoding system. Figure 4 shows the location of a TRAU 305 according to a preferred embodiment of the invention in a mobile communication network. This TRAU 305 comprises means 308 for processing the received speech parameters so that an SP flag can be determined from the parameters to indicate whether the received frame contains speech parameters or comfort noise parameters. In addition, TRAU 305 comprises means 308, by means of which the HO flag can be determined from the received parameters to indicate the first frame after the hangover period. Furthermore, TRAU 305 comprises means 309 for decoding the speech with a codec agreed on in advance, for example. TRAU 305 also comprises means 310, to which the synthesized speech data and the SP and HO flag can be temporarily moved. In addition, TRAU 305 comprises means 311, by which said information can be read from the buffer circuit and according to the information be recoded by some other codec, and by which means 311 the parameters of frames containing comfort noise can be updated, when required. Furthermore, TRAU 305 comprises means 312, to which the parameters of the encoded data and the SP flag can be moved and in which means 312 the frames to be transmitted forward can be selected on the basis of the value of the SP flag, for example. According to a preferred embodiment, TRAU 305 transmits forward only the frames that contain speech data. It is clear to a person skilled in the art that the means presented can be understood as a microprocessor circuit or the like, which implements the operations presented above by means of inputted programs, for example. Preferably the

microprocessor is provided with memory, in which the speech data and the values of the flags, for example, can be temporarily saved.

5 The TRAU 305 shown in Fig. 4 is located in connection with a Base Transceiver Station (BTS) 304 of the mobile communication network. Fig. 4 also shows a Base
10 Station Controller (BSC) and a Mobile Switching Centre (MSC) of the mobile communication network. It is clear to a person skilled in the art that the network elements are separate operational units, as shown by lines 301, 302 and 303 in Fig. 4. Fig. 5 shows corresponding network elements. In this exemplary embodiment, TRAU 305 is located in the immediate vicinity of the base station controller 306.
15 Fig. 6 shows a third possibility of locating TRAU 305 in connection with the mobile switching centre 307 as a separate operational unit. It is clear to a person skilled in the art that TRAU 305 can also be located in other possible network elements. Network elements of the GSM system have been used as examples in this description when discussing how a transcoder according to the invention can be
20 placed in the network topology. It is clear that a transcoder according to the invention can also be placed in other network elements than TRAU 305 and also in other systems than the GSM to perform corresponding operations as those presented here.

20 It is clear to a person skilled in the art that the terms used above have been used as examples, and their sole purpose is to clarify the application of a method according to the invention. The arrangement according to the invention can also be used in other systems than the GSM. Particularly advantageously the method presented above is applied in any system which encodes and decodes speech, within the scope defined by the attached claims.

Claims

1. A method for matching two different encoding methods in a telecommunication system using a discontinuous transmission method between the transmitter and receiver, characterized in that in the signal path the signals transmitted by the transmitter are made suitable for the receiver so that
 - for a data frame, at least one information parameter containing at least two content identifiers is formed of the data parameters received (101),
 - data corresponding to the original data is synthesized from the data parameters (101) of the received frames,
 - the synthesized data is transmitted for recoding with a encoding method suitable for the receiver,
 - during recoding, at least some data parameters (107) of the frames are updated on the basis of at least one value of said content identifiers of the information parameter and
 - on the basis of the value of at least one other content identifier of the information parameter, the frames to be transmitted to the receiver are selected from all recoded data frames.
2. A method according to Claim 1, characterized in that the data parameters (107) of the frames to be updated are data parameters that describe background noise.
3. A method according to Claim 1, characterized in that the value of at least one of said content identifiers of the information parameter comprises information about the first frame after a hangover period.
4. A method according to Claim 1, characterized in that the value of at least one other of said content identifiers of the information parameter comprises information about the contents of the frame.
5. A network element, which is arranged to match two different encoding methods in a telecommunication system using a discontinuous transmission method between the transmitter and receiver, characterized in that in the signal path the signals transmitted by the transmitter are arranged to be made suitable for the receiver by a network element, which comprises

- means (308) by which at least one information parameter containing at least two content identifiers is formed for a data frame of the data parameters received (101),
 - means (309) by which synthesized data corresponding to the original contents of the data is formed of the data parameters (101) of the received frames,
- 5 - means (311) for recoding the synthesized data with an encoding method suitable for the receiver,
- means (311) for updating the data parameters of at least some frames on the basis of at least one value of the content identifiers of said information parameter and
- 10 - means (312) for selecting the frames to be transmitted to the receiver on the basis of at least one other value of the content identifiers of the information parameter from all the recoded data frames.
6. A network element according to Claim 5, characterized in that it is a Transcoder/Rate Adaptor Unit (TRAU) (305).

(57) Abstract

In general, this invention concerns speech encoding and decoding used in digital radio systems and a method by which the processing capacity required can be reduced in a telecommunication system using discontinuous transmission between a transmitter and receiver. In particular, the method according to the invention is used to match two telecommunication systems using different encoding methods between the transmitter and receiver. In the method, the signals transmitted by the transmitter are made suitable for the receiver in the signal path so that in the first step, at least one information parameter comprising at least two content identifiers is formed for each data frame of the data parameters (101) received. In the next step, data corresponding to the original data is synthesized from the data parameters (101) of the received frames, after which the synthesized data is transmitted for recoding with an encoding method suitable for the receiver. In the final step, during recoding, at least some data parameters (107) of the frames are updated on the basis of at least one value of said content identifiers of the information parameter, and the frames to be transmitted to the receiver are selected from all the recoded data frames on the basis of the value of at least one other content identifier of the information parameter. In addition, the invention concerns a network element, which is arranged to implement the method described above.

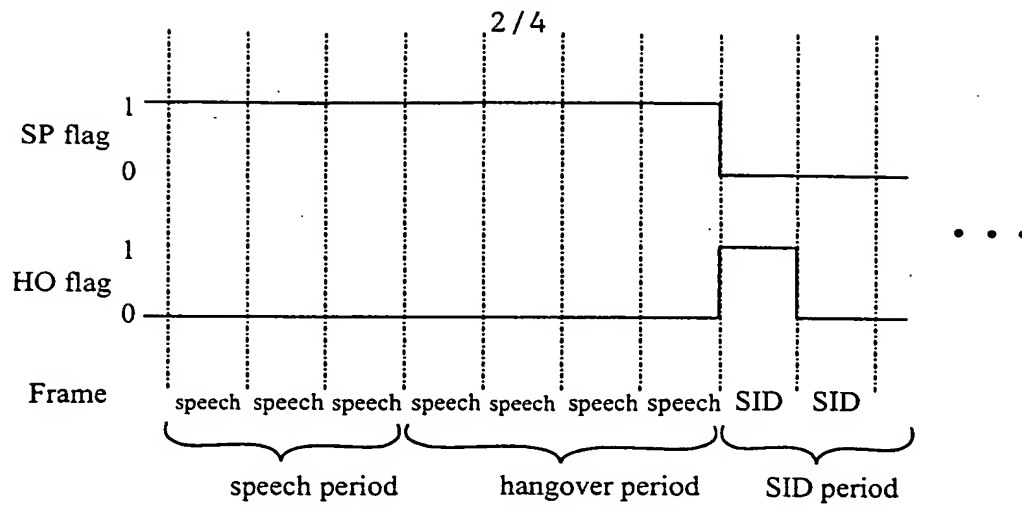


Fig. 3a

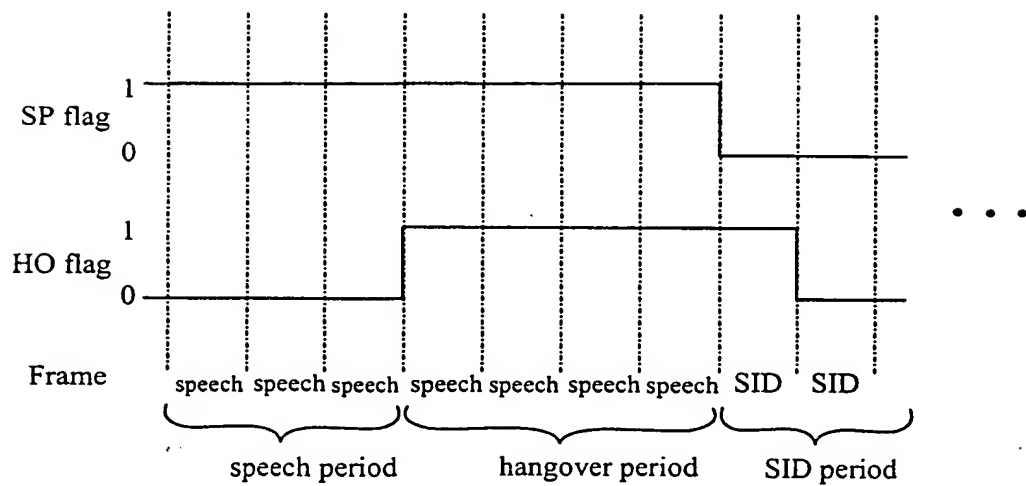


Fig. 3b

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 50194	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI00/00647	International filing date (day/month/year) 14/07/2000	Priority date (day/month/year) 14/07/1999
International Patent Classification (IPC) or national classification and IPC G10L11/02		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.



2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

- I ☒ Basis of the report
- II ☐ Priority
- III ☐ Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
- IV ☐ Lack of unity of invention
- V ☒ Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
- VI ☐ Certain documents cited
- VII ☒ Certain defects in the international application
- VIII ☒ Certain observations on the international application

Date of submission of the demand 09/02/2001	Date of completion of this report 17.04.2001
Name and mailing address of the international preliminary examining authority:  European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465	Authorized officer La Gioia, C Telephone No. +49 89 2399 2418 

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

International application No. PCT/FI00/00647

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-11 as originally filed

Claims, No.:

1-6 as originally filed

Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/FI00/00647

☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes: Claims 1-6
	No: Claims
Inventive step (IS)	Yes: Claims 1-6
	No: Claims
Industrial applicability (IA)	Yes: Claims 1-6
	No: Claims

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

SECTION V

- A. The following document has been considered for the purposes of this report:

D1: EP-A-0843301

- B. The present application satisfies the criteria set forth in Article 33(1)-(3) PCT because the subject-matter of independent claims 1 and 5 is novel in respect of the presently available prior art and involves an inventive step (Rule 65(1)(2) PCT), since the presently available prior art neither discloses nor renders obvious a method or apparatus for matching two different encoding methods in which during recoding, the data parameters of some frames are updated on the basis of at least one of two content identifiers of an extracted information parameter for the frame and, on the basis of the other of the two content identifiers, the frames to be transmitted to the receiver are selected from the recoded frames.

By means of said distinguishing features, it is possible to avoid unnecessary computations in the speech transmission, in particular, performing twice voice activity detection as in the prior art.

- B.1 The dependent claims add further features to the respective independent claims and thus also relate to novel and inventive subject-matter.

SECTION VII

- A. Independent claims 1 and 5 should have preferably been drafted in the one part form, since a redraft in a two part form correctly delimited with respect to the prior art (see document D1) would have caused an involute wording of the claim.
- B. The document D1 is not been identified in the description nor is the relevant background art disclosed therein discussed. The requirements of Rule 5.1(a)(ii) PCT are, thus, not fulfilled.

**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT - SEPARATE SHEET**

International application No. PCT/FI00/00647

SECTION VIII

- A. The application does not meet the requirements of Article 6 PCT, for the following reasons.

In claim 1, line 11, the wording 'at least some data parameters (107) of the frames' should probably have read 'the data parameters (107) of at least some frames'; see independent claim 5 and the description, page 6, line 30 to page 7, line 1.

PCT REQUEST

50194

Original (for SUBMISSION) - printed on 14.07.2000 10:21:54 AM

0 0-1	For receiving Office use only International Application No.	PCT/FI 0 0 / 0 0 6 4 7
0-2	International Filing Date	1 4 JUL 2000 (1 4 -07- 2000)
0-3	Name of receiving Office and "PCT. International Application"	The Finnish Patent Office PCT International Application
0-4 0-4-1	Form - PCT/RO/101 PCT Request Prepared using	PCT-EASY Version 2.90 (updated 10.05.2000)
0-5	Petition The undersigned requests that the present international application be processed according to the Patent Cooperation Treaty	
0-6	Receiving Office (specified by the applicant)	National Board of Patents and Registration (Finland) (RO/FI)
0-7	Applicant's or agent's file reference	50194
I	Title of invention	METHOD FOR DECREASING THE PROCESSING CAPACITY REQUIRED BY SPEECH ENCODING AND A NETWORK ELEMENT
II II-1 II-2 II-4 II-5	Applicant This person is: Applicant for Name Address:	applicant only all designated States except US NOKIA NETWORKS OY P.O. Box 300 FIN-00045 Nokia Group Finland
II-6	State of nationality	FI
II-7	State of residence	FI
II-8	Telephone No.	+358-9-51121
II-9	Facsimile No.	+358-9-51168080
III-1 III-1-1 III-1-2 III-1-4 III-1-5	Applicant and/or inventor This person is: Applicant for Name (LAST, First) Address:	applicant and inventor US only LAKANIEMI, Ari Suvantokatu 1 D 30 FIN-33100 Tampere Finland
III-1-6	State of nationality	FI
III-1-7	State of residence	FI

PCT REQUEST

50194


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IV-1	Agent or common representative; or address for correspondence The person identified below is hereby/has been appointed to act on behalf of the applicant(s) before the competent International Authorities as:	agent
IV-1-1	Name	BERGGREN OY AB
IV-1-2	Address:	P.O. Box 16 FIN-00101 Helsinki Finland
IV-1-3	Telephone No.	+358-9-693701
IV-1-4	Facsimile No.	+358-9-6933944
IV-1-5	e-mail	email.box@berggren.fi
V	Designation of States	
V-1	Regional Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AP: GH GM KE LS MW MZ SD SL SZ TZ UG ZW and any other State which is a Contracting State of the Harare Protocol and of the PCT EA: AM AZ BY KG KZ MD RU TJ TM and any other State which is a Contracting State of the Eurasian Patent Convention and of the PCT EP: AT BE CH&LI CY DE DK ES FI FR GB GR IE IT LU MC NL PT SE and any other State which is a Contracting State of the European Patent Convention and of the PCT OA: BF BJ CF CG CI CM GA GN GW ML MR NE SN TD TG and any other State which is a member State of OAPI and a Contracting State of the PCT
V-2	National Patent (other kinds of protection or treatment, if any, are specified between parentheses after the designation(s) concerned)	AE AG AL AM AT AU AZ BA BB BG BR BY BZ CA CH&LI CN CR CU CZ DE DK DM DZ EE ES FI GB GD GE GH GM HR HU ID IL IN IS JP KE KG KP KR KZ LC LK LR LS LT LU LV MA MD MG MK MN MW MX MZ NO NZ PL PT RO RU SD SE SG SI SK SL TJ TM TR TT TZ UA UG US UZ VN YU ZA ZW
V-5	Precautionary Designation Statement In addition to the designations made under items V-1, V-2 and V-3, the applicant also makes under Rule 4.9(b) all designations which would be permitted under the PCT except any designation(s) of the State(s) indicated under item V-6 below. The applicant declares that those additional designations are subject to confirmation and that any designation which is not confirmed before the expiration of 15 months from the priority date is to be regarded as withdrawn by the applicant at the expiration of that time limit.	
V-6	Exclusion(s) from precautionary designations	NONE

PCT REQUEST

50194

Original (for SUBMISSION) - printed on 14.07.2000 10:21:54 AM

VI-1	Priority claim of earlier national application		
VI-1-1	Filing date	14 July 1999 (14.07.1999)	
VI-1-2	Number	991605	
VI-1-3	Country	FI	
VI-2	Priority document request The receiving Office is requested to prepare and transmit to the International Bureau a certified copy of the earlier application(s) identified above as item(s):	VI-1	
VII-1	International Searching Authority Chosen	Swedish Patent Office (ISA/SE)	
VIII	Check list	number of sheets	electronic file(s) attached
VIII-1	Request	4	-
VIII-2	Description	11	-
VIII-3	Claims	2	-
VIII-4	Abstract	1	50194.txt
VIII-5	Drawings	4	-
VIII-7	TOTAL	22	
	Accompanying items	paper document(s) attached	electronic file(s) attached
VIII-8	Fee calculation sheet	✓	-
VIII-10	Copy of general power of attorney	✓	-
VIII-16	PCT-EASY diskette	-	diskette
VIII-18	Figure of the drawings which should accompany the abstract	2	
VIII-19	Language of filing of the international application	Finnish	
IX-1	Signature of applicant or agent		
IX-1-1	Name	BERGGREN OY AB	
IX-1-2	Name of signatory	Sirpa Kuisma	
IX-1-3	Capacity	Patent Attorney	

FOR RECEIVING OFFICE USE ONLY

10-1	Date of actual receipt of the purported international application	14 JUL 2000	(14 -07- 2000)
10-2	Drawings:		
10-2-1	Received		
10-2-2	Not received		
10-3	Corrected date of actual receipt due to later but timely received papers or drawings completing the purported international application		
10-4	Date of timely receipt of the required corrections under PCT Article 11(2)		
10-5	International Searching Authority	ISA/SE	
10-6	Transmittal of search copy delayed until search fee is paid		

PCT REQUEST

50194

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11-1	Date of receipt of the record copy by the International Bureau	21 AUG 2000	21.08.00
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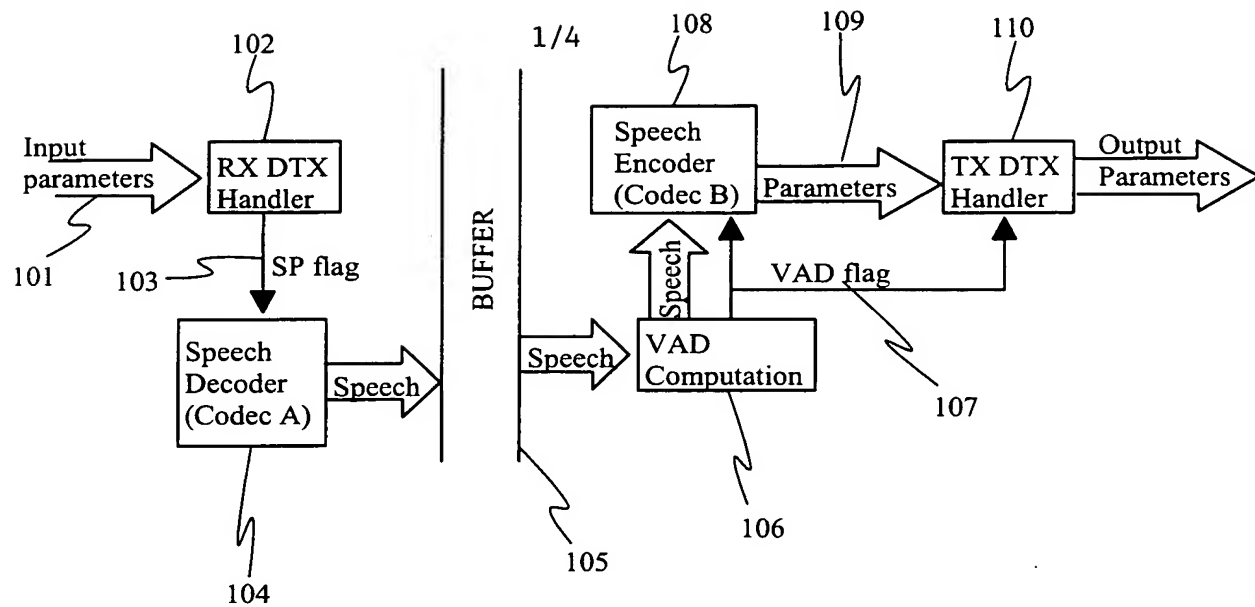


Fig. 1
PRIOR ART

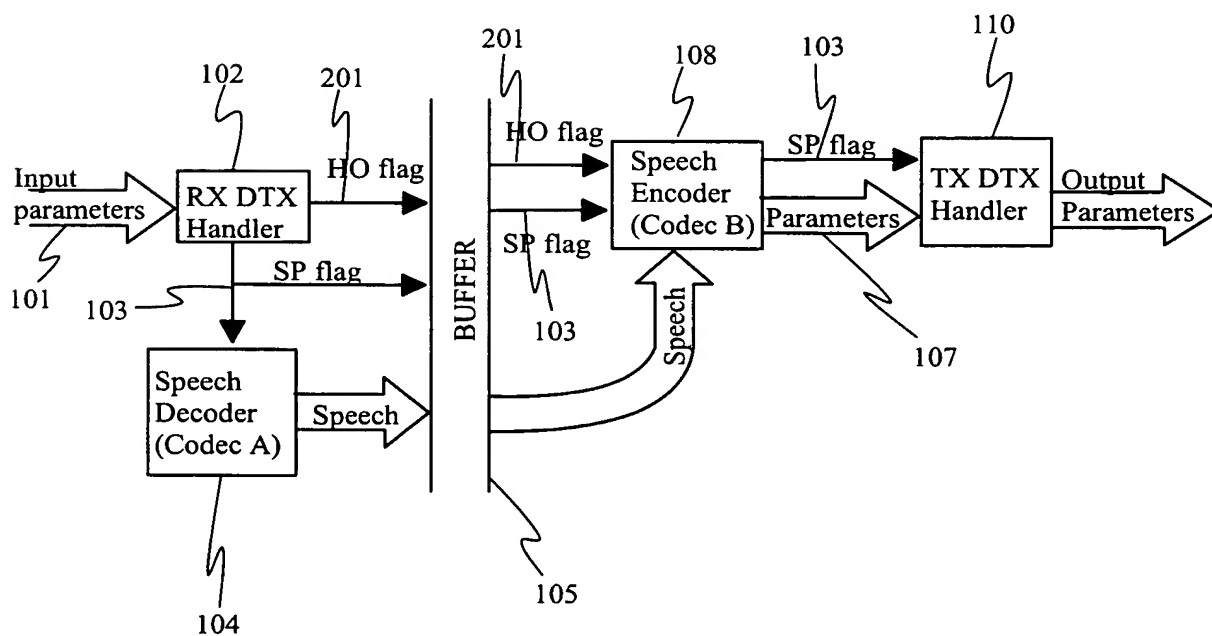


Fig. 2

2/4

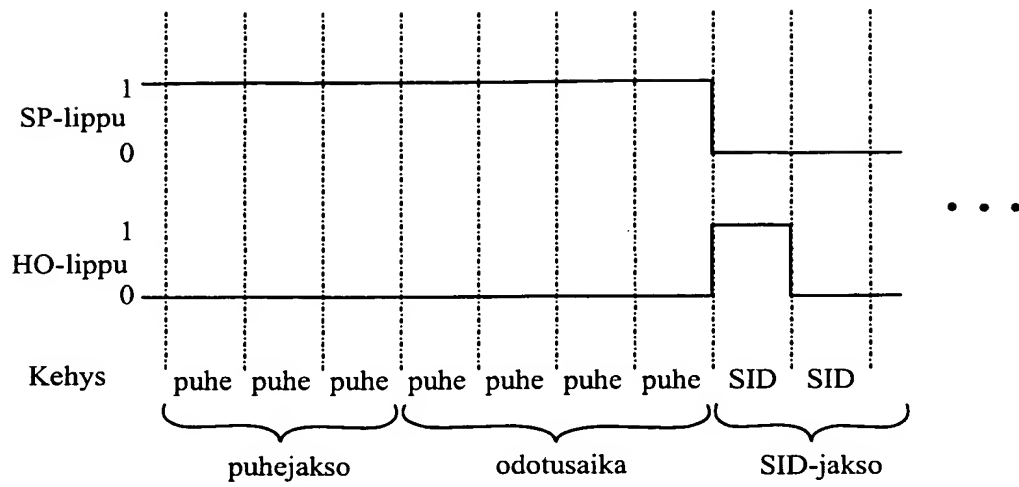


Fig. 3a

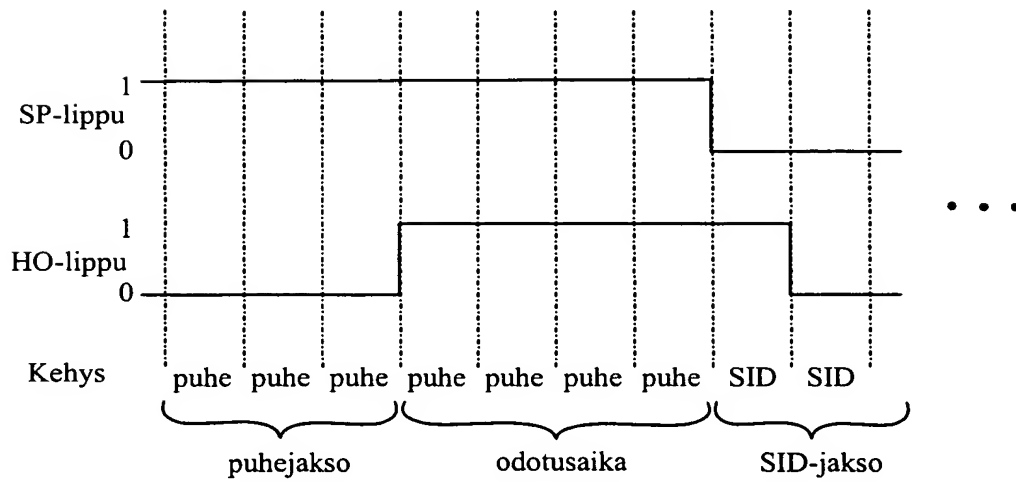


Fig. 3b

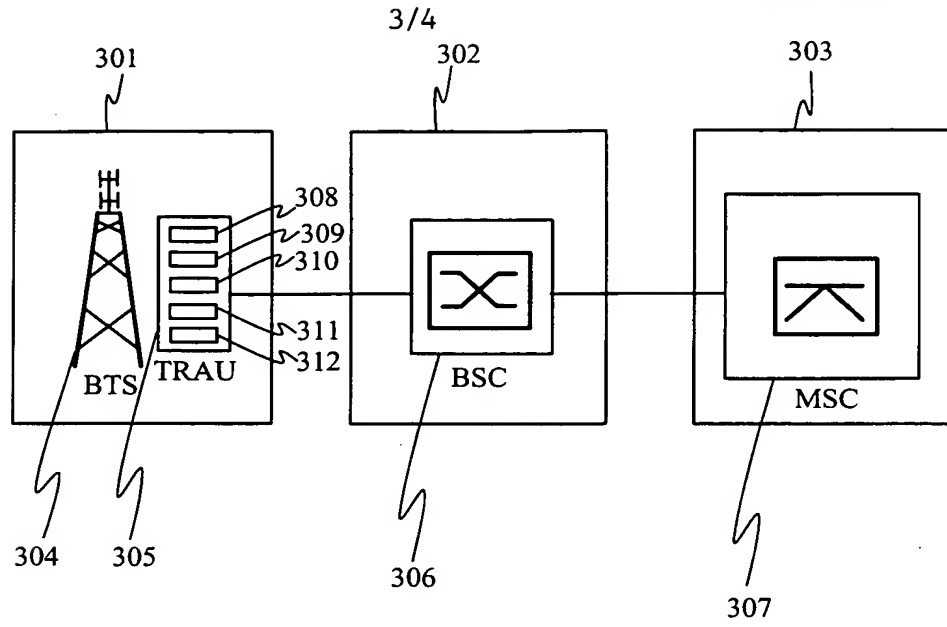


Fig. 4

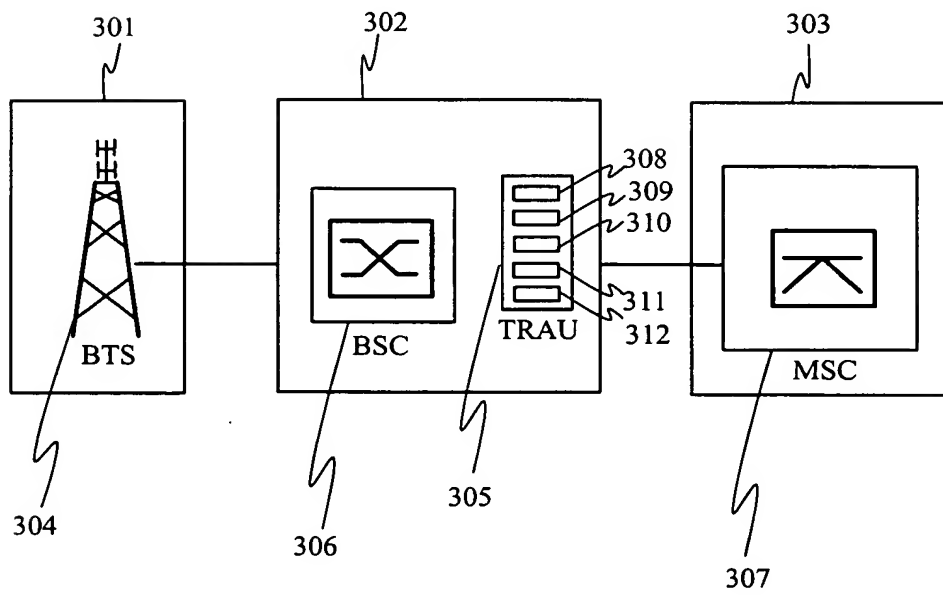


Fig. 5

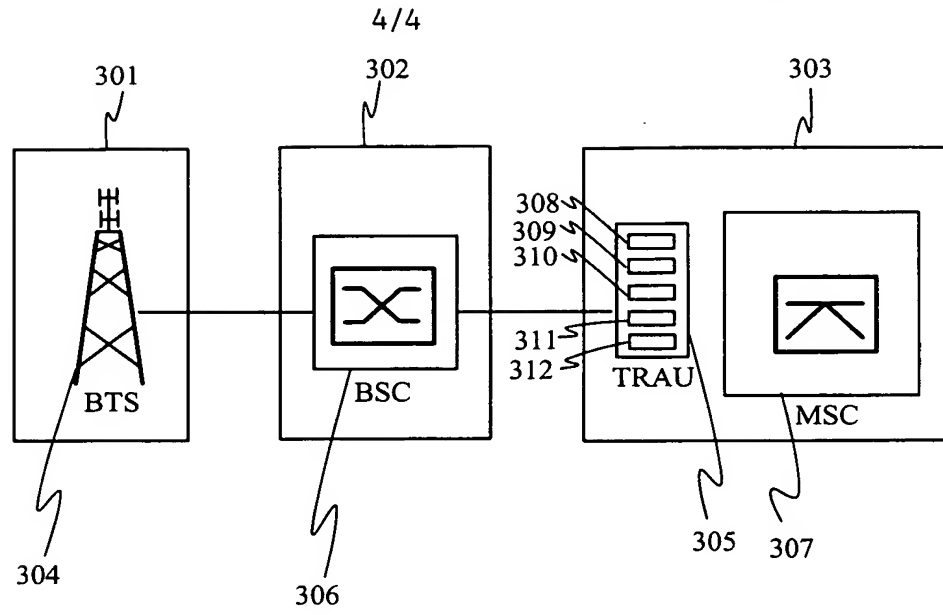


Fig. 6

Menetelmä puhekoodaukseen ja puhedekoodaukseen tarvittavan laskentakapasiteetin vähentämiseksi ja verkkoelementti

5 Tämä keksintö koskee yleisesti digitaalisissa radiojärjestelmissä käytettävää puhekoodausta ja -dekoodausta ja erityisesti menetelmää, jonka avulla voidaan tarvittavaa laskentakapasiteettia vähentää epäjatkovaa lähetystä lähettimen ja vastaanottimen välillä käytävässä tietoliikennejärjestelmässä.

10 Nykyaikaisissa puheenkoodaustekniikoissa käytetään järjestelyä, jossa puhekoodekit prosessoivat puhesignaalia jaksoissa, joita kutsutaan puhekehyksiksi tai pelkästään kehyksiksi. Termillä koodekki tarkoitetaan tässä sitä järjestelyä, jolla puhetta voidaan koodata. Edullisesti se käsittää jonkin koodausalgoritmin ja välineet sen toteuttamiseksi puhesignaalille. Eräs tyypillinen puhekoodekin kehyspituus on 20 ms, joka vastaa 160 näytettä 8 kHz:n näytteenottotaajuudella. Yleisesti puhekehykset vaihtelevat 10 ms:sta 30 ms:iin. Jokainen puhekehys käsitellään puhekooderissa, ja
15 näistä kehyksistä muodostetaan tiettyjä koodausparametreja, jotka välitetään dekooderille. Dekooderi muodostaa syntetisoidun puhesignaalin kyseisten parametrien avulla.

20 Digitaalisissa solukkoradiopuhelinjärjestelmissä, kuten GSM (Global System for Mobile communications) -järjestelmässä, käytetään yleisesti ns. epäjatkovaa lähetystapaa (DTX; Discontinuous Transmission), joka määritellään myös useissa puheenkoodausstandardeissa. Epäjatkuvalla lähetystavalla tarkoitetaan yleisesti sitä, että päätelaitteen lähetinosa kytketään pois päältä suurimmaksi osaksi siitä ajasta, jolloin käyttäjä ei puhu eli päätelaitteella ei ole mitään lähetettävää. Tällä pyritään pienentämään päätelaitteen keskimääräistä tehonkulutusta ja parantamaan radiotaajuuksien
25 hyötykäyttöä, koska pelkkää hiljaaoloa välittävän signaalin lähettäminen aiheuttaa turhia häiriöitä muihin samanaikaisiin radioyhteyksiin. Eräiden tutkimusten mukaan ainoastaan 40 % välitetystä datasta sisältää varsinaista puhedataa. Loppuosa on hiljaaoloa tai taustakohinaa. Näin ollen epäjatkuvalla lähetystavalla, jossa sellaiset kehykset, jotka eivät sisällä varsinaista puhetta, poistetaan, saavutetaan useita etuja.
30 Ensinnäkin kooderin prosessointikuormitusta voidaan pienentää, koska ”ylimääräisiä” kehyksiä ei koodata lainkaan. Toiseksi, välitettävien kehysten lukumäärän pienentyessä vähenee myös laitteen tehonkulutus. Edelleen, verkon kuormitusta voidaan pienentää, kun ”ylimääräiset” kehykset poistetaan välitettävästä datasta.

Tyypillisesti epäjatkuvasa lähetystavassa puheen havaitsemiseen käytetään ns. puheaktiivisuuden ilmaisua (VAD; Voice Activity Detection). Puheaktiivisuuden ilmaisu tapahtuu esimerkiksi siten, että puheaktiivisuuden ilmaisun järjestetään tutki-
maan jokainen välitettävä kehys, jonka perusteella tehdään päätös siitä, sisältääkö
5 kyseinen kehys puhedataa vai ei. Puheaktiivisuuden ilmaisimen toiminta perustuu sen sisäisiin muuttujiin ja ilmaisimen ulostulona annetaan edullisesti yksi bitti, jota nimitetään VAD-lipuksi (VAD flag). VAD-lipun arvo 1 vastaa tällöin tilannetta, jossa käsiteltävänä on puhetta, ja arvo 0 tilannetta, jossa käyttäjä on hiljaa. Näin ol-
len lipun ollessa ylhäällä kehys sisältää puhedataa ja kyseinen kehys voidaan lähet-
10 tää. Vastaavasti VAD-lipun ollessa alhaalla voidaan kyseinen kehys poistaa kokoaan.

Epäjatkuvasa lähetystavassa on eräs huono puoli. Kun lähetys katkaistaan, katoaa myös se taustakohina, joka on olemassa puhetta sisältävissä kehyksissä. Tämä saat-
taa aiheuttaa erittäin epämiellyttävän efektin vastaanottopäässä. Epäjatkuvasa lähe-
15 tystavassa lähetyksen katkaiseminen voi tapahtua nopeasti ja epäsäännöllisin väliajoin, jolloin vastaanottaja kokee nopeasti vaihtelevan äänentason häiritsevä. Eri-
tyisesti, kun taustakohinan taso on korkea, saattaa lähetyksen katkaiseminen huonontaa jopa puheen ymmärrettävyyttä. Näin ollen edullisesti myös silloin, kun ei välitetä kehyksiä vastaanottopäähän, tuotetaan vastaanottimessa jotakin synteettistä
20 kohinaa, joka muistuttaa lähettimen taustamelua ja jota kutsutaan mukavuuskohinaksi (CN; Comfort Noise).

Mukavuuskohinan tuottaminen tapahtuu esimerkiksi siten, että aluksi varsinaisen taustakohinan taso arvioidaan muutaman taustakohinaa sisältävän kehyksen avulla silloin, kun VAD-lipun arvo muuttuu ykkösestä nolaksi. Epäjatkuvasa lähetystilas-
25 ta päättävä elin välittää nämä muutamat kehykset vastaanottimelle puhekehyksinä. Tätä jaksoa, jolloin puhepurske on päättynyt, mutta puhekehysten lähetys ei ole vielä kytkeytynyt pois päältä, kutsutaan odotusajaksi (hangover period). Odotusai-
kana välitettävät kehykset sisältävät ainoastaan taustakohinasta johtuvaa dataa, jol-
loin mukavuuskohinan parametrit voidaan turvallisesti määrittää näiden kehysten
30 avulla. Mukavuuskohinaparametrien välitykseen vastaanottimelle käytetään edullisesti nk. hiljaisuusilmaisinkehystä eli SID (Silence Descriptor) -kehystä. SID-kehys-
ten parametrien arvoja päivitetään säännöllisesti ja ainakin silloin, kun taustakohi-
nan taso muuttuu. SID-kehystä voidaan käytännössä hyödyntää ainakin seuraavalla kahdella tavalla. Ensinnäkin, välittömästi odotusajan jälkeen lähetetään hiljaisuus-
35 ilmaisinkehys eli SID-kehys. SID-kehyksiä välitetään tämän jälkeen säännöllisesti. Tällaista järjestelyä käytetään esimerkiksi GSM-järjestelmän puhekoodekeissa. Toi-

nen mahdollisuus on se, että SID-kehys lähetetään välittömästi odotusajan jälkeen, mutta seuraava SID-kehys välitetään vasta sitten, kun kooderi havaitsee muutoksen taustakohinan ominaisuuksissa.

- 5 Ideaalisessa tilanteessa sekä lähettävä päätelaite että vastaanottava päätelaite käyttävät samaa puheenkoodausmenetelmää. Tällaisessa tapauksessa koodattua puhetta ei tarvitse muuttaa jollekin toiselle koodausmenetelmälle sopivaksi. Kuitenkin käytännössä usein näin joudutaan tekemään. Tällaisessa tilanteessa koodattu puhedata koodataan toiseksi koodinmuuntimen (Transcoder) avulla. Koodinmuunnin voi sijaita missä tahansa signaalitiellä lähettäjän ja vastaanottajan välillä.
- 10 Tekniikan tason mukaiset koodinmuuntimet on tyypillisesti toteutettu kuvassa 1 esitetyllä tavalla. Koodinmuuntimen sisäänmenona on lähettimen välittämät sisäänmenoparametrit 101. Koodinmuuntimen epäjatkuvan lähetyksen vastaanotinlohko 102 on järjestetty arvioimaan se, että sisältävätkö vastaanotetut parametrit puhetta vai mukavuuskohinaa. Tieto kehyksen sisällöstä välitetään puhedekooderille 104 esimerkiksi lipun SP (Speech Present) 103 avulla. Lisäksi puhedekooderille 104 välitetään myös kyseinen kehys. Kehyksen dekodoustapa riippuu lipun SP 103 arvosta.
- 15 Dekoodauksen jälkeen syntetisoitu puhe tai mukavuuskohina siirretään koodinmuuntimen sisäiseen puskuripiiriin 105. Puskuripiiriin 105 sisällön koodaus uudelleen aloitetaan, kun puskuripiiri 105 sisältää riittävästi dataa. Dataa koodattaessa
- 20 uudelleen käytetään aluksi puheaktiivisuuden ilmaisinta 106 tutkimaan, sisältääkö kyseinen kehys puhetta vai taustakohinaa. Kehyksen sisältämän datan laadun perusteella puheaktiivisuuden ilmaisinta 106 muodostaa VAD-lipun 107 ja antaa sille arvon. Lisäksi se välittää VAD-lipun 107 arvon ja siihen tulleen kehyksen sellaisenaan eteenpäin puhedekooderille 108. VAD-lipun 107 arvo annetaan myös koodinmuuntimen lähetinyksikölle 110. Puhedekooderi 108 prosessoi siihen tulevan datan ja välittää koodatun datan parametrit 109 lähetinyksikölle 110. Lähetinyksikkö 110 tarkastaa saamiensa VAD-lippujen 107 arvojen perusteella, mitkä kehykset välitetään verkkoon ja mitkä ei. Jotta signaalia vastaanottavan päätelaitteen vastaanotinlohko ylläpitäisi myös mukavuuskohinan muodostamista, voidaan joitakin mukavuuskohinaa
- 25 sisältäviä kehyksiä välittää niin ikään vastaanottimelle, joiden mukavuuskohinaa sisältävien kehysten parametreja on tarvittaessa päivitetty puhedekooderissa 108.

- 30 Ongelmana tekniikan tason mukaisissa ratkaisuissa on se, että puheaktiivisuuden ilmaisinta käytetään kahdesti. Ensimmäisen kerran sitä käytetään lähettävän päätelaitteen kooderipiirissä ja sitten uudelleen koodinmuuntimessa. Tämä tarkoittaa käytännössä sitä, että puhedataa välitettäessä suoritetaan tarpeettomia laskentaproseduure-

ja, koska tekniikan tason mukaisissa ratkaisuissa samalle datavirralle suoritetaan kahdesti sama puheaktiivisuuden ilmaisuproseduuri.

Tämän keksinnön tavoitteena on poistaa edellä esitetty tekniikan tason mukainen ongelma.

- 5 Keksinnön tavoitteet saavutetaan toteuttamalla koodinmuuntimeen järjestely, jonka avulla voidaan yksinkertaisemmin tarkastaa kehyksen sisällön laatu, jolloin vältetään turhalta laskentakapasiteetin käytöltä.

10 Keksinnön mukaiselle menetelmälle kahden erilaisen koodaustavan yhteensovittamiseksi epäjatkovaa lähetystapaa lähettimen ja vastaanottimen välillä käyttävässä tietoliikennejärjestelmässä, on tunnusomaista se, että signaalitiellä lähettimen lähettämät signaalit sovitetaan vastaanottimelle sopiviksi siten, että

- vastaanotetuista dataparametreista muodostetaan datakehystä kohti ainakin kaksi sisältötunnistetta käsittävä ainakin yksi informaatioparametri,
- vastaanotettujen kehysten dataparametreista syntetisoidaan alkuperäistä dataa vastaavaa dataa,
- 15 - syntetisoitu data välitetään koodattavaksi uudelleen vastaanottimelle sopivalla koodaustavalla,
- uudelleenkoodattaessa mainituista sisältötunnisteista ainakin yhden arvon perusteella päivitetään ainakin joitakin kehysten dataparametreja ja
- 20 - ainakin yhden muun sisältötunnisteen arvon perusteella valitaan kaikista uudelleenkoodatuista datakehyksistä vastaanottajalle lähetettävät kehykset.

25 Keksinnön mukaiselle verkkoelementille, joka on järjestetty sovittamaan yhteen kaksi erilaista koodaustapaa epäjatkovaa lähetystapaa lähettimen ja vastaanottimen välillä käyttävässä tietoliikennejärjestelmässä, on tunnusomaista se, että signaalitiellä lähettimen lähettämät signaalit on järjestetty sovitettavaksi vastaanottimelle sopivaksi verkkoelementin avulla, joka verkkoelementti käsittää

- välineet ainakin kaksi sisältötunnistetta käsittävän ainakin yhden informaatioparametrin muodostamiseksi vastaanotetuista dataparametreista datakehystä kohti,
- välineet datan alkuperäistä sisältöä vastaavan syntetisoidun datan muodostamiseksi
- 30 vastaanotettujen kehysten dataparametreista,

- välineet syntetisoidun datan uudelleenkoodamiseksi vastaanottimelle sopivalla koodaustavalla,

- välineet ainakin joidenkin kehysten dataparametrien päivittämiseksi mainituista sisältötunnisteista ainakin yhden arvon perusteella ja

- 5 - välineet vastaanottajalle lähetettävien kehysten valitsemiseksi ainakin yhden muun sisältötunnisteen arvon perusteella kaikista uudelleenkoodatuista datakehyksistä.

Keksinnön edullisia suoritusmuotoja on esitetty epäitsenäisissä patenttivaatimuksissa.

- 10 Keksinnön mukaisesti signaalitieltä, edullisesti koodinmuuntimesta, poistetaan puheaktiivisuuden ilmaisun suorittava proseduuri. Tällaisella järjestelyllä voidaan koodinmuuntimen rakennetta yksinkertaistaa sekä samalla säästää laskentakapasiteettia muihin tarkoituksiin. Tieto kehysten sisällöstä välitetään edullisesti ainakin yhden informaatioparametrin, joka käsittää ainakin kaksi eri sisältötunnistetta, avulla sille elimelle, joka tekee päätöksen eteenpäin lähetettävistä kehyksistä.

- 15 Seuraavassa keksintöä selostetaan yksityiskohtaisemmin viittaamalla oheisiin kuviin, joissa

kuva 1 esittää erään tekniikan tason mukaisen koodinmuuntimen lohkokaaaviota,

kuva 2 esittää erään keksinnön mukaisen koodinmuuntimen suoritusmuotoa,

- 20 kuva 3a ja 3b esittävät eräitä mahdollisuuksia keksinnön mukaisen koodinmuuntimen lippubittien käyttämiseksi osoittamaan kehysten sisältöä,

kuva 4 esittää erästä ensimmäistä verkkojärjestelyä, jossa sovelletaan keksinnön mukaista koodinmuunninta,

kuva 5 esittää erästä toista verkkojärjestelyä, jossa sovelletaan keksinnön mukaista koodinmuunninta ja

- 25 kuva 6 esittää erästä kolmatta verkkojärjestelyä, jossa sovelletaan keksinnön mukaista koodinmuunninta.

Kuvissa käytetään toisistaan vastaavista osista samoja viitenumeroita ja -merkintöjä. Kuvaa 1 on selostettu edellä tekniikan tason kuvauksen yhteydessä.

Kuvassa 2 on esitetty eräs edullinen suoritusmuoto keksinnön mukaisesta koodinmuunnimesta. Koodinmuunnin saa sisäänmenonaan puhesignaalista lähetyspäässä muodostetut parametrit 101. Koodinmuuntimen vastaanotinlohko 102 käsittelee vastaanotetun datan ja muodostaa siitä SP-lipun 103. SP-lippu 103 ilmaisee, että sisältyykö vastaanotettu kehys puhedataa vai mukavuuskohinaa. Tässä puhedata on siis joko varsinaista puhesignaalia tai taustakohinaa. SP-lipun 103 arvon ollessa esimerkiksi 1 kehys sisältää puhedataa tai taustakohinaa ja SP-lipun 103 arvon ollessa 0 kehys sisältää mukavuuskohinaa. Mukavuuskohinaa sisältävä kehys on tässä nimeltään SID-kehys edellä esitetyn mukaisesti. SP-lipun 103 lisäksi vastaanotinlohko 102 määrittää vastaanotetuista kehyksistä HO-lipun 201. HO-lipulle 201 voidaan antaa arvo 1, jos kyseinen kehys on ensimmäinen odotusajan jälkeen, muuten arvo on 0. Alan ammattimiehelle on selvää, että HO-lippu on merkinä siitä, että lähetyksessä on välitetty taustakohinaa odotusaikana, jonka taustakohinan avulla voidaan SID-kehysten sisältämiä parametreja päivittää. Mainitut SP-lippu 103 ja HO-lippu 201 välitetään edullisesti puskuripiirille 105. Tietyn kehyksen SP-lipun 103 arvo välitetään myös dekooderille 104 yhdessä kyseisen kehyksen sisältämien dataparametrien kanssa. Dekooderi 104 on järjestetty dekoddaamaan siihen tulleen kehyksen dataparametrit syntetisoiduksi puhedataksi ja välittämään syntetisoidun puhekehyksen tai mukavuuskohinakehyksen sisäiseen puskuripiiriin 105. Dekooderin 104 käyttämä dekoddausmenetelmä on edullisesti riippuvainen SP-lipun 103 arvosta. Puskuripiirin 105 jälkeinen puhekooderi 108 on järjestetty lukemaan puskuripiirissä 105 olevat HO-lippu 201, SP-lippu 103 ja näihin liittyvä syntetisoitu datakehys. Puhekooderi 108 aloittaa datan uudelleenkodeauksen esimerkiksi vastaavalla tavalla kuin tekniikan tason mukaisissa ratkaisuissa eli silloin, kun puskuripiiriin 105 on syötetty riittävästi dataa. Puhekooderi 108 voi myös päivittää SID-kehysten sisältämän mukavuuskohinan dataparametrit. Puhekooderi 108 välittää datasta muodostetut parametrit 107 sekä SP-lipun 103 lähetinyksikölle 110. Lähetinyksikkö 110 tarkastaa kunkin kehyksen SP-lipun 103 arvon ja välittää eteenpäin ainakin niiden kehysten parametrit, jotka kehykset sisältävät puhedataa. Edullisesti näiden kehysten lisäksi välitetään vastaanottimelle joitakin sellaisia kehyksiä, jotka sisältävät mukavuuskohinaparametreja, jotta vastaanotin voi hyödyntää niitä epämieluisien vastaanottoefektien minimoimiseen. Alan ammattimiehelle on selvää, että dekooderi 104 ja kooderi 108 voidaan järjestää käyttämään eri koodekkeja.

Edellä on esitetty, että mainitut kaksi lippua eli SP-lippu 103 ja HO-lippu 201 ovat erillisiä nk. sisältötunnisteita, joiden avulla voidaan esimerkiksi ilmaista kunkin kehyksen sisältämän datan tyyppi. Alan ammattimiehelle on selvää, että mainittujen sisältötunnisteiden sisältämä informaatio voidaan sisällyttää myös yhden parametrin

alaisuuteen. Tällaista parametria voidaan kutsua esimerkiksi informaatioparametriksi, joka informaatioparametri voi olla esimerkiksi heksadesimaaliluku tai vastaava. Informaatioparametrijärjestelyssä kyseisen parametrin arvosta esimerkiksi ensimmäinen bitti ilmaisee SP-lipun 103 arvon ja toinen bitti HO-lipun 201 arvon, joiden bittien arvoja voidaan muuttaa toisistaan riippumatta. Informaatioparametrilla voi siis olla yksi arvo, jonka arvon osia tutkimalla voidaan saada eri sisältötunnisteiden arvot selville. Alan ammattimiehelle on niin ikään selvää, että kyseiseen informaatioparametriin voidaan tarvittaessa sisällyttää myös muiden vastaavien lippujen arvoja, joita voidaan tarvita esimerkiksi puhekoodauksessa muihin tarkoituksiin. Informaatioparametri voi olla mihin tahansa numerojärjestelmään tai vastaavaan kuuluva, joka soveltuu käytettäväksi edellä esitettyyn tarkoitukseen.

Kuvassa 3a on esitetty ajoituskaavion muodossa keksinnössä käytettyjen sisältötunnisteiden eli SP- 103 ja HO-lippujen 201 tilat riippuen kehysten sisällöstä. Tässä esitetyssä esimerkinomaisessa suoritusmuodossa ensimmäiset kolme kehystä sisältävät puhedataa, jolloin SP-lipun 103 arvo on 1. Näiden kehysten jälkeen tulee tässä esimerkinomaisessa suoritusmuodossa odotusaika, jota kestää yhteensä neljä kehystä ja myös tällöin SP-lipun 103 arvo on 1. Odotusaikana lähetystä ei ole vielä katkaistu, vaikka puhepurske on loppunut. Kehyksissä välitetään edullisesti taustakohinaa, joiden kehysten avulla voidaan määrittää mahdolliset uudet parametrit taustakohinasta muodostetulle mukavuuskohinalle. Alan ammattimiehelle on selvää, että HO-lipun 201 avulla voidaan puhekooderille 108 edullisesti määrittää se, milloin varsinaista puhedataa sisältävien kehysten perässä on odotusjakso, johon odotusjaksoon kuuluvat kehykset sisältävät taustakohinaa, joiden kehysten sisältämän informaation perusteella SID-kehysten mukavuuskohinaparametreja voidaan päivittää. SID-kehysten välityksen aikana mainittujen SP- 103 ja HO-lippujen 201 arvot ovat nolla. Alan ammattimiehelle on selvää, että kun välitettävään signaaliin tulee jotakin dataa, kuten esimerkiksi puhetta tai taustakohinaa, sisältäviä kehymiä, nousevat mainitut liput oikeisiin arvoihin edellä esitetyn mukaisesti.

Kuvassa 3b on esitetty erään toisen keksinnön mukaisen järjestelyn ajoituskaavio, jossa mainittujen SP- 103 ja HO-lippujen 201 tilat on järjestetty asettumaan eri tavalla kuin kuvan 3a tapauksessa. Tässä esimerkinomaisessa tapauksessa ensimmäiset kolme kehystä sisältävät puhedataa, jolloin SP-lipun 103 arvo on 1. Näiden kehysten jälkeen tulee tässä esimerkinomaisessa suoritusmuodossa odotusaika, jota kestää yhteensä neljä kehystä ja myös tällöin SP-lipun 103 arvo on 1. Odotusaikana lähetystä ei ole vielä katkaistu, vaikka puhepurske on loppunut. Kehyksissä välitetään edullisesti taustakohinaa, joiden kehysten avulla voidaan määrittää mahdolliset

- uudet parametrit taustakohinasta muodostetulle mukavuuskohinalle. Tässä esimerkinomaisessa suoritusmuodossa HO-lippu 201 on järjestetty nousemaan ylös, kun odotusajan ensimmäinen kehys on välitysvuorossa. Odotusajan ensimmäisen kehyksen tunnistus voidaan järjestää esimerkiksi vastaanotinlohkossa 102. Myös tässä
- 5 esimerkinomaisessa suoritusmuodossa HO-lippu 201 on järjestetty pidettäväksi ylhäällä aina odotusajan jälkeiseen ensimmäiseen SID-kehykseen saakka. Alan ammattimiehelle on selvää, että edellä mainittujen lippujen tilat voidaan järjestää sellaisiksi, että ne soveltuvat parhaiten kuhunkin sovellukseen, jossa mainittuja lippuja käytetään.
- 10 Edellä esitetyn mukaisella järjestelyllä saavutetaan selkeitä etuja verrattuna tekniikan tason mukaisiin ratkaisuihin. Yleisesti on selvää, että puheaktiivisuuden ilmaisuun käytettävät algoritmit ovat usein hyvinkin monimutkaisia ja näin ollen erittäin raskaita suorittaa. Ohittamalla yksi ylimääräinen puheaktiivisuuden ilmaisu voidaan yksinkertaistaa signaalin prosessointia kokonaisuudessaan sekä säästää prosessointi-
- 15 kapasiteettia muihin toimintoihin. Erityisen edullinen keksinnön mukainen järjestely on tilanteessa, jossa yhteen laitteistoon on integroitu useampi koodinmuunnin. Tällöin kokonaissäätö prosessointikapasiteetissa voi olla erityisen merkittävä. Eräiden kokeiden mukaan esimerkiksi GSM-järjestelmässä käytettävän FR (Full Rate) -koodekin tapauksessa yhden puheaktiivisuuden ilmaisun määrityksen vähentäminen
- 20 on alentanut prosessoinnin monimutkaisuutta merkittävästi.
- Toinen keksinnön mukaisella järjestelyllä saavutettava etu liittyy myös yksinkertaisempaan toteutukseen. Nimittäin, vaikka puheaktiivisuuden ilmaisu on sama jokaisella koodekillä, voi puheaktiivisuuden ilmaisimen toteutustavoissa olla eroa. Tekniikan tason mukaisissa järjestelyissä on mahdollista, että jonkin tietyn koodekin
- 25 tuottama mukavuuskohina voidaan tulkita jonkin toisen koodekin puheaktiivisuuden ilmaisimessa puheeksi, jolloin järjestelmää kuormitetaan turhaan. Erityisesti on huomioitava, että koodekit koodaavat kohinaksi tai vastaaviksi luokitellut kehykset usein yksinkertaisemmin kuin puheeksi luokitellut kehykset. Näin ollen, jos jokin kohinaa sisältävä kehys luokitellaan puheeksi, käytetään tähän kehykseen suurempaa laskentatehoa ja prosessi muuttuu raskaammaksi. Jättämällä puheaktiivisuuden ilmaisu pois koodinmuuntimessa, voidaan välttyä tällaisilta ongelmilta, joiden seurauksena käytetään turhaan suurempaa laskentatehoa.
- 30 Edellä esitetyssä keksinnön kuvauksessa on oletettu, että kehysajat eri koodekeissa ovat samat. Keksinnön mukaista järjestelyä voidaan edullisesti myös soveltaa tapauksessa, jossa kehysajat eroavat toisistaan eri koodekkien välillä. Esimerkinomaisesti voidaan esittää, että koodinmuuntimeen tulevaan dataan on käytetty koodekkia
- 35

A, jonka kehysaika on esimerkiksi 20 ms. Se järjestelmä, johon kyseistä dataa ollaan välittämässä, käyttää koodekkia B, jonka kehysaika on esimerkiksi 30 ms. Tällaisessa tapauksessa keksinnön mukaisessa järjestyksessä voidaan kehysaikojen yhteensovittaminen toteuttaa esimerkiksi siten, että puskuripiirissä 105 olevaan dataan järjestetään SP- ja HO-liput esimerkiksi 10 ms välein. Tällöin muutettaessa koodekin A data koodekin B dataksi dekooderi kirjoittaa jokaista kehystä kohden kaksi SP- ja HO-lippua puskuripiiriin 105. Vastaavasti puhekooderin lukiessa puskuripiiristä 105 dataa, se lukee edullisesti kolme SP- ja HO-lippua kehystä kohden eli yhteensä 30 ms. Koodinmuunnin tekee näiden kolmen lippuparin perusteella arvioinnin siitä, että luokitellaan kyseinen uusi kehys puheeksi vai kohinaksi ja antaa SP-lipulle arvon luokittelun perusteella. Luokittelun perusteena voi olla yksinkertaisimmillaan esimerkiksi se, että jos ainakin kaksi SP-lipuista on ylhäällä uuden SP-lipun arvo on myös 1. Alan ammattimiehelle on selvää, että luokittelussa voidaan käyttää myös muita mahdollisia ratkaisuja, kuten erilaisia kombinaatioita SP- ja HO-lipuista. Jos koodinmuunnin toimii toiseen suuntaan, on selvää, että dekooderi kirjoittaa puskuripiiriin kolme lippuparia, joista puhekooderi lukee edullisesti kaksi lippuparia kehystä kohden. Alan ammattimiehelle on selvää, että kyseiset liput voidaan järjestää datavirtaan myös toisin aikavälein kuin edellä on esitetty. Edullisesti aikaväli on sellainen, että koodekin A ja koodekin B kehysten aikavälit ovat molemmat jaollisia kyseisellä aikavälillä.

Alan ammattimiehelle on selvää, että odotusaika, joka vaikuttaa HO-lipun arvoon, on koodekkiriippuvainen asia. Esimerkiksi GSM-järjestelmän FR-koodekin odotusaika on neljä 20 ms:n kehystä kun taas esimerkiksi standardissa ITU-T G.723.1 esitettyssä koodekissa odotusaika on kuusi 30 ms:n kehystä. Keksinnön mukaisella menetelmällä erilaisten odotusaikojen pituuksien aiheuttamilta mahdollisilta ongelmilta voidaan välttyä. Esimerkiksi, mikäli koodekin A odotusaika on ajallisesti pitempi kuin koodekin B tuottama odotusaika, ei synny ongelmia, sillä puhekooderi voi poistaa ylimääräisen osuuden odotusajasta tarvittaessa. Jos taas koodekin A odotusaika on ajallisesti lyhyempi kuin koodekin B odotusaika, voidaan puhekooderissa lisätä odotusaikaa tarvittaessa. Tämä voidaan toteuttaa esimerkiksi siten, että käytetään samoja mukavuuskohinaa sisältäviä kehyksiä uusiin kehyksiin odotusaikana.

Tarkastellaan seuraavaksi keksinnön mukaisen järjestelyn soveltamista matkaviestinverkossa, kuten esimerkiksi GSM-verkossa. Koodinmuunnin sijaitsee edullisesti päätelaitteiden välillä johonkin verkkoelementtiin liitettynä. Esimerkiksi GSM-verkossa on järjestetty erillinen verkkoelementti nimeltään transkooderi/nopeudenmuuntoyksikkö TRAU (Transcoder/Rate Adaptor Unit). TRAU:n tehtävänä on yleis-

sesti ottaen sovittaa erilaisia signaaleja käyttäviä verkkoja yhteen. Tämä tarkoittaa esimerkiksi sitä, että signaalien siirtonopeudet sovitetaan järjestelmille sopiviksi. Lisäksi TRAU:ssa koodataan puhe uudelleen, jotta se soveltuu välitettäväksi toista puheenkoodausjärjestelmää käyttävään verkkoon. Kuvassa 4 on esitetty keksinnön erään edullisen suoritusmuodon mukaisen TRAU:n 305 sijoittuminen matkaviestinverkkoon. Kyseinen TRAU 305 käsittää välineet 308 vastaanotettujen puheparametrien käsittelemiseksi siten, että parametreista voidaan määrittää SP-lippu osoittamaan, sisältääkö vastaanotettu kehys puheparametreja vai mukavuuskohinaparametreja. Lisäksi TRAU 305 käsittää välineet 308, joiden avulla vastaanotetuista parametreista voidaan määrittää HO-lippu osoittamaan ensimmäinen kehys odotusajan jälkeen. Edelleen TRAU 305 käsittää välineet 309 puheen dekodeeraamiseksi esimerkiksi jonkin ennalta sovitun koodekin avulla. TRAU 305 käsittää edelleen välineet 310, joihin syntetisoitu puhedata ja SP- sekä HO-lippu voidaan väliaikaisesti siirtää. TRAU 305 käsittää välineet 311, joiden avulla mainitut tiedot voidaan lukea puskuripiiristä ja kyseisten tietojen mukaan koodata uudelleen jollakin toisella koodekilla ja joiden välineiden 311 avulla voidaan mukavuuskohinaa sisältävien kehysten parametreja tarvittaessa päivittää. Edelleen TRAU 305 käsittää välineet 312, joihin koodatun datan parametrit sekä SP-lippu voidaan siirtää ja joissa välineissä 312 voidaan esimerkiksi SP-lipun arvoon perustuen valita eteenpäin välitettävät kehukset. Erään edullisen suoritusmuodon mukaisesti TRAU 305 välittää eteenpäin ainoastaan puhedataa sisältävät kehukset. Alan ammattimiehelle on selvää, että esitetyt välineet voidaan käsittää esimerkiksi mikroprosessoripiiriksi, joka toteuttaa edellä esitetyt toiminnot esimerkiksi siihen syötetyn ohjelmiston avulla. Edullisesti mikroprosessoriin on järjestetty muistia, johon esimerkiksi puhedata ja lippujen arvot voidaan väliaikaisesti tallentaa.

Kuvassa 4 esitetty TRAU 305 on sijoitettu matkaviestinverkon tukiaseman (BTS; Base Transceiver Station) 304 yhteyteen. Kuvassa 4 on esitetty myös matkaviestinverkon tukiasemaohjain (BSC; Base Station Controller) 306 sekä matkaviestintakeskus (MSC; Mobile Switching Centre) 307. Alan ammattimiehelle on selvää, että kyseiset verkkoelementit ovat omia toiminnallisia yksiköitään, kuten kuvassa 4 on viivoilla 301, 302 ja 303 esitetty. Kuvassa 5 on esitetty vastaavat verkkoelementit. Tässä esimerkinomaisessa suoritusmuodossa TRAU 305 on sijoitettu tukiasemaohjaimen 306 välittömään läheisyyteen. Kuvassa 6 on edelleen esitetty eräs kolmas mahdollisuus sijoittaa TRAU 305 matkaviestintakeskuksen 307 yhteyteen omaksi toiminnalliseksi yksiköksi. Alan ammattimiehelle on selvää, että TRAU 305 voidaan sijoittaa myös muihin mahdollisiin verkkoelementteihin. Tässä selostuksessa on esimerkinomaisesti käytetty GSM-verkossa esiintyviä verkkoelementtejä kuvatta-

essa keksinnön mukaisen koodinmuuntimen sijoittumista verkkotopologiaan. On selvää, että keksinnön mukainen koodinmuunnin voidaan sijoittaa myös muihin verkkoelementteihin kuin TRAU:hun 305 ja myös muihin järjestelmiin kuin GSM-järjestelmään suorittamaan vastaavia toimintoja kuin mitä tässä on esitetty.

- 5 Alan ammattimiehelle on selvää, että edellä käytetyt termit ovat esimerkinomaisia ja niiden merkitys on ainoastaan selvittää keksinnön mukaisen menetelmän soveltamista. Keksinnön mukaista järjestelyä voidaan käyttää myös muissa järjestelmissä kuin GSM-järjestelmässä. Erityisen edullisesti esitettyä menetelmää sovelletaan missä tahansa puhetta koodaavassa ja dekodaaavassa järjestelmässä oheisten patenttivaatimusten määrittelemän keksinnöllisen ajatuksen puitteissa.
- 10

Patenttivaatimukset

1. Menetelmä kahden erilaisen koodaustavan yhteensovittamiseksi epäjatkovaa lähetystapaa lähettimen ja vastaanottimen välillä käyttävässä tietoliikennejärjestelmässä, **tunnettu** siitä, että signaalitiellä lähettimen lähettämät signaalit sovitetaan vastaanottimelle sopiviksi siten, että
5 vastaanottimelle sopiviksi siten, että
 - vastaanotetuista dataparametreista (101) muodostetaan datakehystä kohti ainakin kaksi sisältötunnistetta käsittävä ainakin yksi informaatioparametri,
 - vastaanotettujen kehysten dataparametreista (101) syntetisoidaan alkuperäistä dataa vastaavaa dataa,
 - 10 - syntetisoitu data välitetään koodattavaksi uudelleen vastaanottimelle sopivalla koodaustavalla,
 - uudelleenkoodattaessa mainituista informaatioparametrin sisältötunnisteista ainakin yhden arvon perusteella päivitetään ainakin joitakin kehysten dataparametreja (107) ja
 - 15 - ainakin yhden muun informaatioparametrin sisältötunnisteen arvon perusteella valitaan kaikista uudelleenkoodatuista datakehyksistä vastaanottajalle lähetettävät kehykset.
2. Patenttivaatimuksen 1 mukainen menetelmä, **tunnettu** siitä, että päivitettävien kehysten dataparametrit (107) ovat taustakohinaa kuvaavia dataparametreja.
- 20 3. Patenttivaatimuksen 1 mukainen menetelmä, **tunnettu** siitä, että mainituista informaatioparametrin sisältötunnisteista ainakin yhden arvo käsittää tiedon odotusajan jälkeisestä ensimmäisestä kehyksestä.
4. Patenttivaatimuksen 1 mukainen menetelmä, **tunnettu** siitä, että mainituista informaatioparametrin sisältötunnisteista ainakin yhden muun arvo käsittää tiedon kehyksen sisällöstä.
25
5. Verkkoelementti, joka on järjestetty sovittamaan yhteen kaksi erilaista koodaustapaa epäjatkovaa lähetystapaa lähettimen ja vastaanottimen välillä käyttävässä tietoliikennejärjestelmässä, **tunnettu** siitä, että signaalitiellä lähettimen lähettämät signaalit on järjestetty sovitettaviksi vastaanottimelle sopivaksi verkkoelementin
30 avulla, joka verkkoelementti käsittää

- välineet (308) ainakin kaksi sisältötunnistetta käsittävän ainakin yhden informaatioparametrin muodostamiseksi vastaanotetuista dataparametreista (101) datakehystä kohti,
 - 5 - välineet (309) datan alkuperäistä sisältöä vastaavan syntetisoidun datan muodostamiseksi vastaanotettujen kehysten dataparametreista (101),
 - välineet (311) syntetisoidun datan uudelleenkoodamiseksi vastaanottimelle sopivalla koodaustavalla,
 - välineet (311) ainakin joidenkin kehysten dataparametrien päivittämiseksi ainakin yhden mainitun informaatioparametrin sisältötunnisteen arvon perusteella ja
 - 10 - välineet (312) vastaanottajalle lähetettävien kehysten valitsemiseksi ainakin yhden muun informaatioparametrin sisältötunnisteen arvon perusteella kaikista uudelleenkoodatuista datakehyksistä.
6. Patenttivaatimuksen 5 mukainen verkkoelementti, tunnettu siitä, että se on transkooderi/nopeudenmuuntoyksikkö (Transcoder/Rate Adaptor Unit TRAU)
- 15 (305).

(57) Tiivistelmä

Tämä keksintö koskee yleisesti digitaalisissa radiojärjestelmissä käytettävää puhekoodausta ja -dekoodausta ja menetelmää, jonka avulla voidaan tarvittavaa laskentakapasiteettia vähentää epäjatkovaa lähetystä lähettimen ja vastaanottimen välillä käyttävässä tietoliikennejärjestelmässä. Erityisesti keksinnön mukaisessa menetelmässä sovitetaan yhteen kahta erilaista koodaustapaa lähettimen ja vastaanottimen välillä käyttävää tietoliikennejärjestelmää. Menetelmässä signaalitiellä lähettimen lähettämät signaalit sovitetaan vastaanottimelle sopiviksi siten, että ensimmäisessä vaiheessa vastaanotetuista dataparametreista (101) muodostetaan datakehystä kohti ainakin kaksi sisältötunnistetta käsittävä ainakin yksi informaatioparametri. Seuraavaksi vastaanotettujen kehysten dataparametreista (101) syntetisoidaan alkuperäistä dataa vastaavaa dataa, minkä jälkeen syntetisoitu data välitetään koodattavaksi uudelleen vastaanottimelle sopivalla koodaustavalla. Lopuksi uudelleenkoodattaessa mainituista informaatioparametrin sisältötunnisteista ainakin yhden arvon perusteella päivitetään ainakin joitakin kehysten dataparametreja (107) ja ainakin yhden muun informaatioparametrin sisältötunnisteen arvon perusteella valitaan kaikista uudelleenkoodatuista datakehyksistä vastaanottajalle lähetettävät kehykset. Lisäksi keksintö koskee verkkoelementtiä, joka on järjestetty toteuttamaan esitetty menetelmä.

PATENT COOPERATION TREATY

PCT

INTERNATIONAL SEARCH REPORT

(PCT Article 18 and Rules 43 and 44)

Applicant's or agent's file reference 50194	FOR FURTHER ACTION	see Notification of Transmittal of International Search Report (Form PCT/ISA/220) as well as, where applicable, item 5 below.
International application No. PCT/FI 00/00647	International filing date (<i>day/month/year</i>) 14 July 2000	(Earliest) Priority Date (<i>day/month/year</i>) 14 July 1999
Applicant Nokia Networks Oy et al		

This international search report has been prepared by this International Searching Authority and is transmitted to the applicant according to Article 18. A copy is being transmitted to the International Bureau.

This international search report consists of a total of 3 sheets.

☒ It is also accompanied by a copy of each prior art document cited in this report.

1. Basis of the report

- a. With regard to the language, the international search was carried out on the basis of the international application in the language in which it was filed, unless otherwise indicated under this item.
- ☐ the international search was carried out on the basis of a translation of the international application furnished to this Authority (Rule 23.1(b)).
- b. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international search was carried out on the basis of the sequence listing:
- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ the statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ the statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

2. ☐ Certain claims were found unsearchable (See Box I).

3. ☐ Unity of invention is lacking (See Box II).

4. With regard to the title,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established by this Authority to read as follows:

5. With regard to the abstract,

- ☒ the text is approved as submitted by the applicant.
- ☐ the text has been established, according to Rule 38.2(b), by this Authority as it appears in Box III. The applicant may, within one month from the date of mailing of this international search report, submit comments to this Authority.

6. The figure of the drawings to be published with the abstract is Figure No. 2

- ☒ as suggested by the applicant. ☐ None of the figures.
- ☐ because the applicant failed to suggest a figure.
- ☐ because this figure better characterizes the invention.

INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00647

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G10L 11/02, G10L 19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G10L, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0843301 A2 (NOKIA MOBILE PHONES LTD.), 20 May 1998 (20.05.98), page 9, line 27 - line 44; page 10, line 5 - line 11 --	1-6
A	US 5867574 A (EROL ERYILMAZ), 2 February 1999 (02.02.99), column 9, line 66 - column 10, line 6, abstract --	1-6
A	US 5483619 A (SIMON BLANCHARD), 9 January 1996 (09.01.96), column 2, line 16 - line 59 --	1-6
A	US 5555546 A (ICHIRO MATSUMOTO), 10 Sept 1996 (10.09.96) --	1-6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

24 November 2000

Date of mailing of the international search report

29 -11- 2000

Name and mailing address of the ISA:

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INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 00/00647

C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	WO 9940569 A2 (NOKIA TELECOMMUNICATIONS OY), 12 August 1999 (12.08.99), page 2, line 25 - page 3, line 18, claim 1 -- -----	1-6

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/11/00

International application No.
PCT/FI 00/00647

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
EP	0843301	A2	20/05/98	BR	9705747 A	30/03/99
				CN	1200000 A	25/11/98
				JP	10190498 A	21/07/98
				US	5960389 A	28/09/99

US	5867574	A	02/02/99	NONE		

US	5483619	A	09/01/96	DE	69317134 D,T	06/08/98
				EP	0561454 A,B	22/09/93
				GB	9205932 D	00/00/00
				JP	6085766 A	25/03/94

US	5555546	A	10/09/96	GB	2290687 A,B	03/01/96
				GB	9512507 D	00/00/00
				JP	8070285 A	12/03/96

WO	9940569	A2	12/08/99	AU	2282899 A	23/08/99
				FI	3771 U	18/02/99
				FI	980298 A,V	10/08/99

PATENT COOPERATION TREATY

From the
INTERNATIONAL PRELIMINARY EXAMINING AUTHORITY

PCT

To:

BERGGREN OY AB
P.O. Box 16
FIN-00101 Helsinki
FINLANDE

Berggren Oy Ab

19-04-2001

SKUPIC

NOTIFICATION OF TRANSMITTAL OF
THE INTERNATIONAL PRELIMINARY
EXAMINATION REPORT
(PCT Rule 71.1)

Date of mailing (day/month/year)	17.04.2001
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Applicant's or agent's file reference 50194	IMPORTANT NOTIFICATION
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International application No. PCT/FI00/00647	International filing date (day/month/year) 14/07/2000	Priority date (day/month/year) 14/07/1999
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Applicant NOKIA NETWORKS OY et al.

1. The applicant is hereby notified that this International Preliminary Examining Authority transmits herewith the international preliminary examination report and its annexes, if any, established on the international application.
2. A copy of the report and its annexes, if any, is being transmitted to the International Bureau for communication to all the elected Offices.
3. Where required by any of the elected Offices, the International Bureau will prepare an English translation of the report (but not of any annexes) and will transmit such translation to those Offices.

4. REMINDER

The applicant must enter the national phase before each elected Office by performing certain acts (filing translations and paying national fees) within 30 months from the priority date (or later in some Offices) (Article 39(1)) (see also the reminder sent by the International Bureau with Form PCT/IB/301).

Where a translation of the international application must be furnished to an elected Office, that translation must contain a translation of any annexes to the international preliminary examination report. It is the applicant's responsibility to prepare and furnish such translation directly to each elected Office concerned.

For further details on the applicable time limits and requirements of the elected Offices, see Volume II of the PCT Applicant's Guide.

Name and mailing address of the IPEA/	Authorized officer
---------------------------------------	--------------------



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PATENT COOPERATION TREATY

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 50194	FOR FURTHER ACTION See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416)	
International application No. PCT/FI00/00647	International filing date (<i>day/month/year</i>) 14/07/2000	Priority date (<i>day/month/year</i>) 14/07/1999
International Patent Classification (IPC) or national classification and IPC G10L11/02		
Applicant NOKIA NETWORKS OY et al.		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.

2. This REPORT consists of a total of 5 sheets, including this cover sheet.

☐ This report is also accompanied by ANNEXES, i.e. sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).

These annexes consist of a total of sheets.

3. This report contains indications relating to the following items:

I	<input checked="" type="checkbox"/> Basis of the report
II	<input type="checkbox"/> Priority
III	<input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability
IV	<input type="checkbox"/> Lack of unity of invention
V	<input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement
VI	<input type="checkbox"/> Certain documents cited
VII	<input checked="" type="checkbox"/> Certain defects in the international application
VIII	<input checked="" type="checkbox"/> Certain observations on the international application

Date of submission of the demand 09/02/2001	Date of completion of this report 17.04.2001
Name and mailing address of the international preliminary examining authority: <div style="display: flex; align-items: center;"> <div> European Patent Office D-80298 Munich Tel. +49 89 2399 - 0 Tx: 523656 epmu d Fax: +49 89 2399 - 4465 </div> </div>	Authorized officer La Gioia, C Telephone No. +49 89 2399 2418



**INTERNATIONAL PRELIMINARY
EXAMINATION REPORT**

International application No. PCT/FI00/00647

I. Basis of the report

1. With regard to the **elements** of the international application (*Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17)*):

Description, pages:

1-11 as originally filed

Claims, No.:

1-6 as originally filed

Drawings, sheets:

1/4-4/4 as originally filed

2. With regard to the **language**, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.

These elements were available or furnished to this Authority in the following language: , which is:

- ☐ the language of a translation furnished for the purposes of the international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of a translation furnished for the purposes of international preliminary examination (under Rule 55.2 and/or 55.3).

3. With regard to any **nucleotide and/or amino acid sequence** disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished.

4. The amendments have resulted in the cancellation of:

- ☐ the description, pages:
- ☐ the claims, Nos.:

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

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☐ the drawings, sheets:

5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed (Rule 70.2(c)):

(Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report.)

6. Additional observations, if necessary:

V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

1. Statement

Novelty (N)	Yes:	Claims	1-6
	No:	Claims	
Inventive step (IS)	Yes:	Claims	1-6
	No:	Claims	
Industrial applicability (IA)	Yes:	Claims	1-6
	No:	Claims	

2. Citations and explanations
see separate sheet

VII. Certain defects in the international application

The following defects in the form or contents of the international application have been noted:
see separate sheet

VIII. Certain observations on the international application

The following observations on the clarity of the claims, description, and drawings or on the question whether the claims are fully supported by the description, are made:
see separate sheet

SECTION V

- A. The following document has been considered for the purposes of this report:

D1: EP-A-0843301

- B. The present application satisfies the criteria set forth in Article 33(1)-(3) PCT because the subject-matter of independent claims 1 and 5 is novel in respect of the presently available prior art and involves an inventive step (Rule 65(1)(2) PCT), since the presently available prior art neither discloses nor renders obvious a method or apparatus for matching two different encoding methods in which during recoding, the data parameters of some frames are updated on the basis of at least one of two content identifiers of an extracted information parameter for the frame and, on the basis of the other of the two content identifiers, the frames to be transmitted to the receiver are selected from the recoded frames.

By means of said distinguishing features, it is possible to avoid unnecessary computations in the speech transmission, in particular, performing twice voice activity detection as in the prior art.

- B.1 The dependent claims add further features to the respective independent claims and thus also relate to novel and inventive subject-matter.

SECTION VII

- A. Independent claims 1 and 5 should have preferably been drafted in the one part form, since a redraft in a two part form correctly delimited with respect to the prior art (see document D1) would have caused an involute wording of the claim.
- B. The document D1 is not been identified in the description nor is the relevant background art disclosed therein discussed. The requirements of Rule 5.1(a)(ii) PCT are, thus, not fulfilled.

SECTION VIII

- A. The application does not meet the requirements of Article 6 PCT, for the following reasons.

In claim 1, line 11, the wording 'at least some data parameters (107) of the frames' should probably have read 'the data parameters (107) of at least some frames'; see independent claim 5 and the description, page 6, line 30 to page 7, line 1.

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A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G10L 11/02, G10L 19/00

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G10L, H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	EP 0843301 A2 (NOKIA MOBILE PHONES LTD.), 20 May 1998 (20.05.98), page 9, line 27 - line 44; page 10, line 5 - line 11 --	1-6
A	US 5867574 A (EROL ERYILMAZ), 2 February 1999 (02.02.99), column 9, line 66 - column 10, line 6, abstract --	1-6
A	US 5483619 A (SIMON BLANCHARD), 9 January 1996 (09.01.96), column 2, line 16 - line 59 --	1-6
A	US 5555546 A (ICHIRO MATSUMOTO), 10 Sept 1996 (10.09.96) --	1-6

☒ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

"A" document defining the general state of the art which is not considered to be of particular relevance

"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

24 November 2000

Date of mailing of the international search report

29 -11- 2000

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International application No.

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C (Continuation). DOCUMENTS CONSIDERED TO BE RELEVANT		
Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
P,A	WO 9940569 A2 (NOKIA TELECOMMUNICATIONS OY), 12 August 1999 (12.08.99), page 2, line 25 - page 3, line 18, claim 1 -- -----	1-6

INTERNATIONAL SEARCH REPORT
Information on patent family members

02/11/00

International application No.

PCT/FI 00/00647

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
EP	0843301	A2	20/05/98	BR	9705747 A	30/03/99
				CN	1200000 A	25/11/98
				JP	10190498 A	21/07/98
				US	5960389 A	28/09/99

US	5867574	A	02/02/99	NONE		

US	5483619	A	09/01/96	DE	69317134 D,T	06/08/98
				EP	0561454 A,B	22/09/93
				GB	9205932 D	00/00/00
				JP	6085766 A	25/03/94

US	5555546	A	10/09/96	GB	2290687 A,B	03/01/96
				GB	9512507 D	00/00/00
				JP	8070285 A	12/03/96

WO	9940569	A2	12/08/99	AU	2282899 A	23/08/99
				FI	3771 U	18/02/99
				FI	980298 A,V	10/08/99
